

CHEMICAL & METALLURGICAL ENGINEERING

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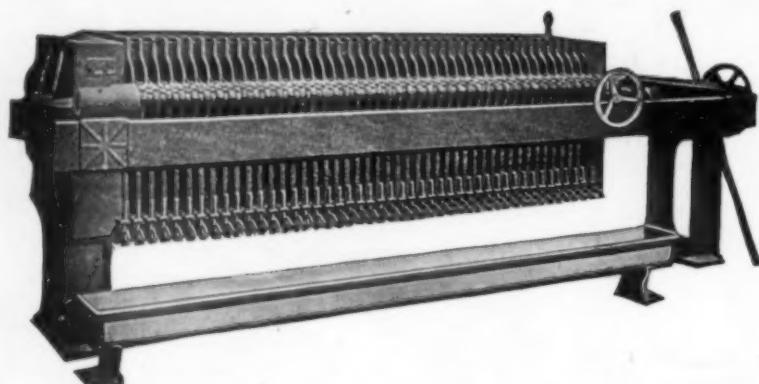
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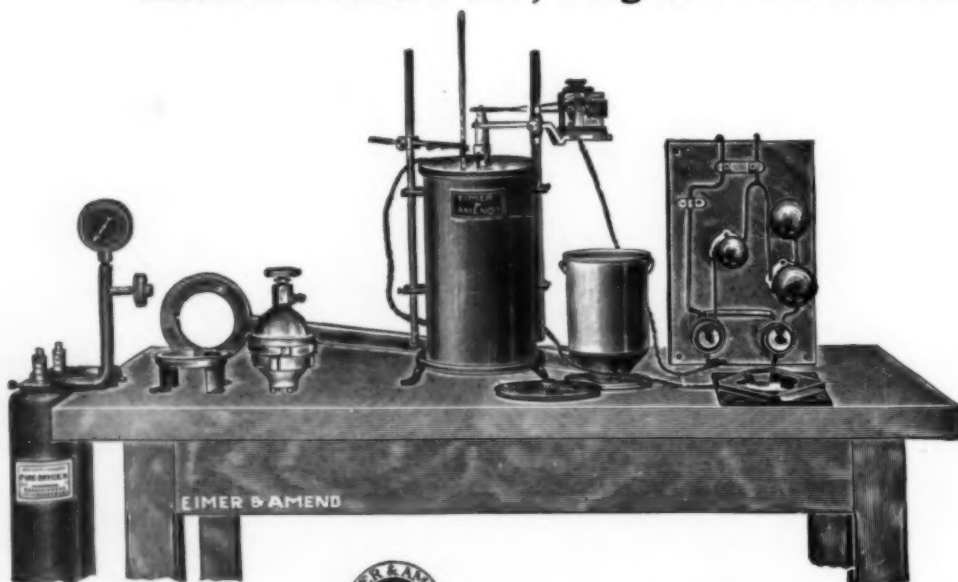
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CHEMICAL & METALLURGICAL ENGINEERING

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Can We Learn From The Dry Cleaner?

FOR A LITTLE more than a year the National Association of Dry Cleaners has maintained an industrial fellowship at the Bureau of Standards. The leaders of this large but entirely empirical industry entertained the hope that the dry cleaner might profit by the use of scientific methods, materials and equipment developed by technologists in some of the longer established industries. The results of researches that have already reached fruition are such as not only to justify the association's experiment but to indicate that perhaps some of the older industries will have something to learn from the newcomer.

One of the dry cleaner's most serious problems is the removal of impurities from the solvents that have been used for cleaning clothes. The insoluble impurities are principally dirt, water and soap that can, of course, be removed by sedimentation or, more rapidly, by centrifugal clarification. This is not the case, however, with the soluble impurities such as the fats, oils and greases as well as their decomposition products. These soon impart to the solvent an amber color and a disagreeable odor. Saponification with caustic soda, while satisfactorily removing the fats and greases, has little effect on the rancid odor.

Because of recent progress in the development of vegetable carbons, it was natural that these should be suggested for the final deodorizing, but it remained for the investigator to show that the various steps in the purification could be combined into a single method. Briefly, this consisted in substituting a solution of trisodium phosphate for the caustic soda and adding it with the carbon to the dirty solvent. As the mixture is agitated in a suitable settling tank, the carbon quickly adsorbs the undesirable color and odor. The mild alkali saponifies the dissolved fats and greases, converting them into insoluble soaps that on settling carry down with them the decolorizing carbon. The result is a water-white solvent from which all of the impurities have been removed. The sludge from the process is reused many times or until its purifying properties are completely exhausted.

The method is suggestive of other applications in our industries. In petroleum refining, for example, occasionally there are off-color distillates from cracking processes that require unusual treatment in order to yield a sweet-smelling, water-white motor fuel. To avoid tedious percolation through a fullers earth filter, it might be possible to agitate the distillate with decolorizing carbon, add an inert flocculent material such as the insoluble soap formed in the dry cleaner's process, and finally allow the mixture to settle. Likewise in the production of the various volatile solvents and organic

chemical liquids, it would seem that the method offers a simple and effective means of removing the last traces of some impurity that affects the appearance and, therefore, the salability of the finished product.

Certainly the experiment is worth the trying. In doing so perhaps some of our most standardized industries are going to find that there is something to learn even from the dry cleaner. Unlike the hot-house exotic, the technical achievement can often be transplanted.

Is Engineering Foundation Serving Its High Purpose?

RECEIPT of one of the Research Narratives of Engineering Foundation, "five-minute stories of research and invention," directs attention to that institution concerning which there has been a growing spirit of unfavorable criticism. Established in 1914 and endowed by Ambrose Swasey "for the furtherance of research in science and engineering, or for the advancement in any other manner of the profession of engineering and the good of mankind," it seems questionable whether in its present activities Engineering Foundation is living up to its opportunity or fulfilling the ideals of its founder.

According to the financial statement in the annual reports for 1921, 1922 and 1923 by far the greater proportion of its expenditure is absorbed in maintenance of the organization, with only a fraction devoted to research and investigation. In maintenance we include salaries, office expenses, stationery and printing, traveling expenses, equipment, publication, publicity, and salaries and rent for the division of engineering, National Research Council. The ratio of overhead expense to the support of research in the years mentioned is as follows:

	1921	1922	1923
General expense	\$15,103	\$18,310	\$16,781
Support of research.....	1,847	1,433	3,635
	<u>\$16,950</u>	<u>\$19,743</u>	<u>\$20,416</u>

From 7 to 12 per cent of the total expenditure is for the promotion of research, while 88 to 93 per cent has been absorbed in running expenses. The figures lead to the distressing conclusion that a laudable project is languishing in its main function and spending its substance in moving the administrative machinery.

Engineering Foundation has in its officers, executive committee and board the elect of the four great American engineering societies, but its conduct and management are scarcely creditable to the profession or commensurate with the ideals of the founder.

Judged on its own financial statement, the Foundation should make a drastic reduction in its overhead expenses and take steps more nearly to serve its high purpose.

Should the Soap Industry Have a Co-operative Technical Association?

TECHNICAL men in the soap industry generally recognize the lack of useful discussion of their problems either in society meetings, current technical literature or elsewhere. Many openly express a desire for means of assistance in solving their various problems. Technology is gradually changing through the industry; modified apparatus and innovations in production practice are common. Yet in the many plants where these things are happening the course is being laid out and followed by men thrown largely upon their individual initiative.

It is a conspicuous fact that no organization binds the technologists having in common the interests of this industry. This has already been pointed out in these columns and not without a very definite reaction on the part of soap plant engineers and executives. In last week's issue of *Chem. & Met.* several of their views were recorded. The entire range of possible reaction was struck, from enthusiastic approval to frowning condemnation. It may be mentioned in passing that other letters than those published were received, some of these coming from the largest concerns now producing. The consensus, when based on established company policy, was that such an organization would act for the benefit of weak sisters at the expense of the big brothers in the industry.

There is no surer indication of the fundamental fallacy in such an attitude than the reactions of the technical men in plants, great or small, with whom we have talked this matter over privately. Almost without exception the idea is heartily indorsed in these quarters. Such men appreciate the value of co-operation while understanding its logical limitations. They realize that company secrets must be held inviolate, but at the same time they know that an immense amount of co-operative work is possible without harm to big brother and of large potential value to all. They have seen other industries take long strides through technical societies and have observed that almost invariably the benefit accruing to the larger concerns has been greater than to the smaller, simply because the well-organized research necessary to make new suggestions commercially practical is usually an asset of the progressive big brother. As a matter of fact, they have seen big brother and weak sister meet on common technical ground, and have often seen the weak sister do more than her reasonable share of work rather than less at society meetings.

Suspicion, jealousy, personal prejudice, fear on the part of a few soap company officials, hinder the formation of an association of soap technologists. A large number of technical men are ready and in many cases eager to co-operate further than is common practice at present. We are not uninformed of the camaraderie existing among the superintendents, chemists and engineers of a few scattered plants—a camaraderie that extends to cordial interchange of the courtesies of plant visits, etc., but we deplore the limitations of such a feeling. We know, for instance, that a certain big brother not long ago requested permission of a not-so-

big brother to visit a given plant. When the request was made it was frankly stated that the courtesy could not be returned.

As long as such a situation obtains little hope can be held out for the success of any venture that requires above all else sincerity of purpose in establishing a legitimate clearing house of technical information. Many, probably it is safe to say the majority, of the technical men in the industry would personally be glad to support an association that would at least assist in filling a recognized gap in their individual experiences. If these men can show those who hold the purse strings that other industries have found such an organization generally profitable, that the soap industry can well afford a similar kind of co-operation, then the impasse now blocking any constructive action may be overcome.

Government Ownership and Our Transportation Problem

IS GOVERNMENT ownership of railroads imminent? We do not believe it is, but politics has brought the subject up for discussion and has helped to focus attention again on this serious phase of our transportation problem. No one of the current issues is of more vital interest to industry than the maintenance of adequate transportation facilities.

In the light of this country's single and rather disastrous experiment in the direction of government ownership, it is worth while marshaling a few essential facts and figures as an answer to those whose enthusiasm for the theory has carried them far afield from the known results of its practice. Such an answer was made last week by Charles Donnelly, president of the Northern Pacific, whose address before the American Legion convention in St. Paul gives us a careful, thoughtful analysis of our transportation problem. Quite justly he asks the proponents of government ownership why a change so foreign to American traditions is demanded—on what charges is private control indicted?

Certainly it is not inefficiency of operation, for the record made since the return of the railroads to their owners March 1, 1920, is one of progress unequalled in industrial history. With their properties seriously impaired because of poor maintenance, with equipment badly in need of repair and replacement and widely scattered because of unit control, the owners were given the task of putting our great transportation systems on an efficient and economic basis. We can well be proud of what they accomplished. In 4 years of private operation the \$3,000,000 per day increase in operating expenses that occurred shortly after the railroads were returned to their owners has been entirely wiped out, and in addition the \$6,200,000 per day increase made during the 26 months of government operation has been reduced more than a third. From an average of \$17,000,000 in September, 1920, the daily operating expenses of Class I railroads had fallen in June, 1924, to an average of \$12,139,000. This has come about through a reduction in the number of employees and through more efficient use both of men and equipment.

If inefficiency is not the charge against private management, is it that the return is too high—that the railroads are making too much money? Consideration of this involves the much-debated question of railroad evaluation, the basis upon which the return is to be

computed. The railroads contend that their value is more than 21 billion dollars. Senator La Follette's estimate is only 13 billion dollars. But using as a basis the value carefully determined under the law by the Interstate Commerce Commission, we find that during no year since the government relinquished control have the railroads realized the net return of 5½ per cent to which the law entitles them. In 1920 and 1921 the return was less than 3½ per cent, in 1922 it was slightly more than 4 per cent, and in 1923 it was about 5 per cent. Surely these are not exorbitant profits during a period when the demands on the roads have been the greatest in history.

In his address Mr. Donnelly made effective use of the arguments based on the loss to the government of taxes paid by the railroads—amounting to almost a million dollars a day—and on the fact that government ownership means the extension of bureaucratic control, with the addition of 2,000,000 railroad employees to the federal payroll.

The fact remains, however, that at the present time there is not a wide sentiment in favor of government ownership. The greater danger lies in the fact that a lack of knowledge on the part of the general public may lead to a policy of confiscation and consequently the defeat of private management simply by excessive regulation. For that reason it is fitting that our industries should recognize the true progress the railroads have made and give sympathetic consideration to their problems.

Recent Developments in Cylindrical Milling Practice

THE art of fine grinding mineral and chemical substances efficiently is a comparatively recent development, and considerable advance has been made in technology in consequence of the application of new ideas. With a realization of the enhanced physico-chemical effects of increased area, the attainment of accurate sizing and a cheapening of operations, the scope of fine grinding has been enlarged, with the result that mechanical comminution is now an important phase of many industrial operations.

The cylindrical mill has found wide application. In the selection of mediums, steel balls have displaced to a large extent the imported flint pebbles previously used in long mills. In this connection it is interesting to note the success that has attended the adoption, first suggested by William T. MacDonald, of iron or steel cubes in place of the customary spherical balls. Motion pictures taken at normal mill speeds but projected slowly indicate that comminution is effected more by abrasion than by impact, a result that confirmed former tests in which comparison was made in an effort to determine the relative efficiency of rough and smooth balls, respectively. A suggestion that smelter slag might be molded for use as a grinding-mill medium, after adequate annealing, has apparently met with no response, although hardness and toughness figures would appear to justify research in this connection for the grinding of metalliferous ores. Slag bricks are in use at Washington, D. C., between the street-car tracks, but these are imported from England, attempts at manufacture in the United States having been unsuccessful.

With the increased attention paid to wet grinding

and the development of efficient methods of mechanical classification, the tendency has been to reduce the length of the cylinder, to minimize the overgrinding of the material and to subject that already ground to classification and to permit release at the earliest possible moment. With the shortening of the mill, attention was paid to the possibility of increasing the movement of the balls, and in this connection a development by F. O. Williamson has attracted favorable notice. The feed and discharge ends of the mill, instead of being flat and vertical, as in the ordinary type of cylindrical mill, are stepped in a manner that produces a propeller-like action on the contents, with the result that the balls are continuously thrown toward the center. The sliding action common to many machines of this type is therefore avoided. Increased movement in all directions is insured, which should result in additional abrasion and grinding.

No easy and reliable method for the estimation of the relative mechanical efficiency of mills, based on power input and screen analyses of feed and product has yet been developed. Disagreement as to the validity of either the Kick or Rittinger law, over a sufficient range of reduction, is still in evidence. A clean-cut method of comparison, used in conjunction with data referring to initial and upkeep costs, would be welcomed by many engineers whose decision is now largely based on or influenced by empirical data of operating results of one type of mill only.

Constructive Attack

On the High Cost of Living

PERIODICALLY there appears in the technical and daily press a notice to the effect that whereas formerly 49 varieties of milk bottles were produced there are now but 9. Or perhaps in the case of hotel china-ware, where formerly more than 700 different pieces were offered for sale, a reduction to 160 has been made. Perhaps too the Division of Simplified Practice of the Department of Commerce may have been mentioned in connection with the achievement.

Little by little this work which was begun by Secretary Hoover is extending its sphere of influence. Each year new groups of commodities are "simplified." The procedure is well worked out. Producers, distributors and users of a given commodity or group of commodities are invited to confer by the Division of Simplified Practice in the Department of Commerce, though the initial impetus must come from one of the interested groups. Under this impartial leadership this question is discussed, "Is it essential that so many varieties of these products be manufactured?" The answer is inevitably, "No!" and the real problem of simplification is begun, to discover which of the many sizes or kinds can be eliminated.

Just how much money this movement will save the country it is impossible to estimate. But that the saving is positive and spectacular cannot be denied. The division deserves commendation, encouragement and active support. Everyone can contribute to this support by calling to the attention of producers who have not been through the simplification mill the great desirability of so doing. And it is a contribution that pays dividends, for every simplification that is made will tend to cut down the cost of production, the cost of distribution and therefore the cost of living.



View From the Campus

Technical Report of Ithaca Meeting

Résumés of the Papers of Interest to Men in the Process Industries
Presented at the Fall Meeting of the American Chemical Society

Editorial Staff Report

SELDOM has it been the privilege of the American Chemical Society to hold one of its meetings in a locality possessed of such natural charm as Ithaca. The Cornell campus, a thing of classic beauty, cut by ravines of fascinating picturesqueness, the magnificent new Baker Laboratory of Chemistry, the comfortable dormitory accommodations, the general feeling of being perfectly welcome and completely at home, these are but a few of the impressions that press for attention as we look back over a pleasant week.

Fortunately the technical program was not too long and there was ample time to enjoy beautiful surroundings and to mingle together to an extent that has not been possible at many of the recent meetings.

Last week's issue presented the features of the Council meeting, the general addresses and the important absorption symposium held by the Division of Industrial and Engineering Chemistry. Other important phases of the technical program are summarized in the following pages.

PAINT TECHNOLOGISTS DISCUSS COLLOIDS

The new Section of Paint and Varnish Chemistry, which held its first meeting at the spring convention of the society in Washington, had an enthusiastic all-day session on Sept. 11. The recorded attendance was more than one hundred. Chairman H. A. Gardner was unable to be present and the section's meeting was led by John R. MacGregor and Dr. W. T. Pearce, the section's secretary.

The chief papers and discussion of the session dealt with the application of colloid chemistry to the paint and varnish industry. Dr. W. D. Bancroft fittingly welcomed the Paint and Varnish Section to Cornell by

presenting his discussion of "Some Problems of Linseed Oil." Very helpful comments were made on the need of more authentic data in the literature of the subject.

The paper by Dr. F. L. Browne on "Colloid Chemistry in Paint and Varnish Industries" was an appropriate introduction to the general discussion and symposium to follow. The direct application of the principles of colloid chemistry as outlined in Svedberg's monograph was pointed out for paint and varnish phenomena. It became evident that the section's field is almost wholly concerned with the working and behavior of colloid systems.

In the symposium proper, which was led by P. R. Croll, lists of specific phenomena (met with in the daily practical work of every paint technologist) were presented by those who had given detailed study to these observations. So varied were the topics suggested by this symposium that three full hours of valuable discussion was warranted. Leading authorities in the science from university and industry met on this common ground—interest of applied chemistry.

J. H. Calbeck, in his paper, "Some Physical Characteristics of Lead Pigments," added to the value of his former publications on particle size measurements and the relations between the fineness or surface of a pigment and its behavior in paint.

J. D. Jenkins and P. R. Croll gave their observations on dirt collection by painted surfaces. It was found that in damp or wet exposures gloss paints collected more dirt than flat surfaces, while in dry indoor exposures little difference was found. The reduction in the dirt-collecting tendency by raising the pigment-oil ratio of the film was suggested as one means toward cleaner painted surfaces.

W. T. Pearce's preliminary report on a study of paint vehicles outlined present test exposures on six paint oils using about ten pigment combinations. Details of exposures and future places for the work were discussed.

F. L. Browne reported on the progress of the co-operative study on "The Painting Characteristics of Different Kinds of Woods." This work, under the direction of the Forest Products Laboratory, has already created much public interest. Test fence exposures of two paints on sixteen species of wood are now being made at ten representative locations across the United States.

PRACTICAL SUGGESTIONS ON LEATHER PROBLEMS

Nine papers were presented before the Division of Leather and Gelatin Chemistry, the program being completed on Wednesday afternoon.

Henry B. Merrill reported the results of an investigation on the effect of sulphides in unhairing with lime liquors. He showed that the sulphhydrate ion combines with hair or other keratinous matters, forming compounds that are much more easily hydrolyzed than keratin itself. The sulphhydrate ion alone does not produce an unhairing action, but it does assist the hydroxide ion very markedly. On the other hand, the sulphhydrate ion does not combine with the skin protein, collagen; nor does it assist in the alkaline hydrolysis of collagen.

Preliminary studies of the extraordinary action of alkaline earth chlorides upon leather have been made by Guido Daub, who found that 2M calcium chloride solutions would completely destroy the structure of skins in as short a time as 15 minutes. The structure of tanned leather is similarly destroyed, although this requires a longer time and vegetable-tanned leather is somewhat more resistant than chrome. Magnesium chloride was found to have the same effect, whereas magnesium sulphate of equivalent concentration produced no change and 4M sodium chloride is also without action. As neither the magnesium nor the chlorine ion can be held responsible, the phenomenon is most unusual and is being studied further. The change is so rapid that it can be followed under the microscope; the skin fibers

quickly become transparent and gradually lose all semblance of structure.

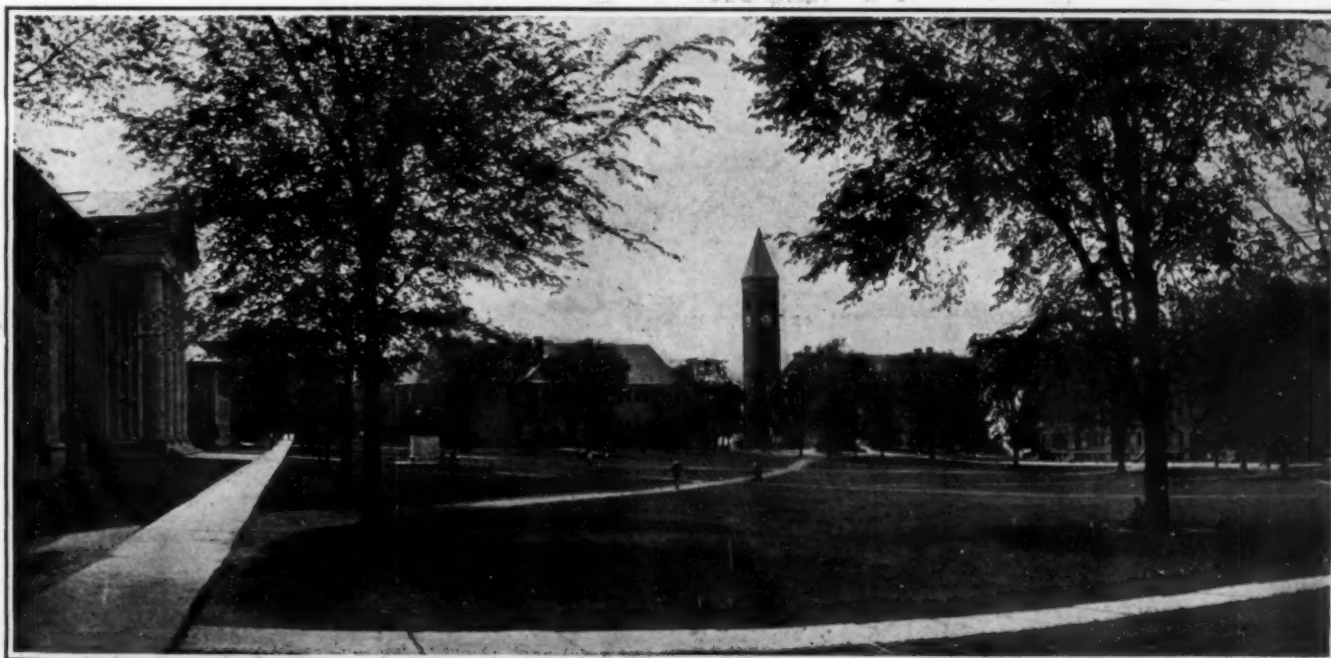
Discussion brought out the fact that gelatin manufacturers might be able to take advantage of this action. With calcium chloride, it is only a matter of minutes for the skin to become transparent. After washing free of CaCl_2 , it goes into solution upon warming to 40 deg. C. and on cooling sets to a firm jelly. Other interesting points were brought out: zinc chloride is used in making liquid glues; potassium iodide and urea will both melt gelatin jellies; magnesium salts should not be permitted in salt used for curing hides and skins; leather should not be used for packing in pumps handling CaCl_2 or MgCl_2 brines.

George O. Lines used the Wilson-Gallun method to measure the degree of plumping of calfskin as a function of p_n value. With HCl a point of maximum plumping occurs at 2.4 and with NaOH at 11.6. Addition of NaCl causes a diminution of plumping except at p_n values below 0.5 or above 12.5.

Formaldehyde tanning was found by Prof. A. W. Thomas to take place most readily at p_n values of 8 or 9. Difficulty was experienced in measuring the amount of formaldehyde fixed. In discussion it was brought out that the general term aldehyde tannage is misleading, for with the possible exception of acetaldehyde, formaldehyde is the only one of the series that is capable of producing leather.

In discussing further studies on quinone tanning reported by Professor Thomas and Dr. Margaret W. Kelly, it was stated that pretannage with quinone was practiced in France, 1 to 2 per cent being used in the presence of lactic acid. The work of Thomas and Kelly having shown that fixation of quinone was much greater in alkaline solutions, it would seem that much better results could be obtained in practice by following their data. Skins tanned with quinone at $p_n = 9$ will resist the action of boiling water.

Effect of water content of leather on fatliquoring was found by Armond W. Baer to vary with kind of leather. Vegetable-tanned calf from 1 to 40 per cent relative humidity when plunged into a neatsfoot oil-sodium oleate emulsion took up very little oil (2 per



The Cornell Quadrangle



cent maximum) and the amount was directly proportional to the surface exposed and independent of the water content. Chrome leather took up more oil as the initial moisture content increased, indicating penetration. Values ranged from 16 per cent for the driest to 25 per cent for the wettest piece.

It was shown at the last meeting that with changing relative humidity from 0 to 100 per cent, chrome-tanned upper leathers change in area 18 per cent as against only 6 per cent for vegetable-tanned leather. Erwin J. Kern found that increasing amounts of oil in the leathers retard the approach toward equilibrium. With vegetable leather oil has but little effect on the final area change, but increasing amounts of neatsfoot oil in chrome leather, up to 12 per cent, causes a decided increase in area change with humidity.

Dr. Margaret W. Kelly showed that it was not possible to separate tannins and non-tannins by ultrafiltration, as proposed by R. J. Brown.

In concluding the program, John Arthur Wilson described the hydrogen electrode vessel as modified for general routine use around a tannery. Many of the liquors rapidly poison the electrode, and a cheap, easily changed electrode has been devised.

LEVULOSE AND PHOTOSYNTHETIC SUGARS

At the Sugar Division meeting the papers ranged from fundamental theory to practical operating results.

Two papers, by Prof. E. C. C. Baly, University of Liverpool, and Prof. J. C. Irvine, St. Andrews, on the mechanism of the photosynthesis of sugars and the nature of the products obtained, attracted wide attention. Under the action of ultra-violet light and in the presence of calcium carbonate to neutralize acid formed, a sugar sirup was obtained from 40 per cent formaldehyde solution. There was strong indication that the sugar was a hexose, but it was not possible to determine which one.





Levulose as a new addition to the commercially available sugars seems within the bounds of possibility from the results of R. F. Jackson, C. G. Silsbee and M. J. Proffitt. They have found that it is possible to crystallize levulose with satisfactory yields from water solutions, thus obviating the necessity for the expensive non-aqueous solvents hitherto employed. They have also developed a technique for obtaining a calcium levulate precipitate of granular character that may be filtered rapidly. The raw material, Jerusalem artichoke, is a prolific, hardy and inexpensive crop, adaptable to wide variation in soil and climate. As the tubers do not deteriorate in the ground, as does the sugar beet, it has been suggested that by means of this crop the operation of a beet-sugar factory could be extended considerably. Any plant with a Steffen house could handle the new product almost without any change in equipment.

Working with a laboratory evaporator similar in

principle to the commercial salt evaporator, W. J. Geldard found that Steffen waste water deposited mixed potassium salts, chloride, nitrate and sulphate containing almost negligible amounts of sodium salts. Further work must be done on other products before it would be commercially feasible, but the study represents a serious attempt to consider the problem of recovering byproducts from the estimated 2,500,000 tons of Steffen waste produced annually.

The first comprehensive survey of available information on the industrial applications of invertase was presented by H. S. Paine, M. S. Badollet and C. F. Walton, Jr. Paine and Badollet also summarized present knowledge on ultrafiltration, dialysis, ultramicroscopy and other colloid phenomena of importance in sugar work.

E. C. Freeland described in great detail a plant for making alcohol-ether motor fuel from cane molasses. As the plant was in the tropics, ether was recovered by



absorption in alcohol instead of by condensation, which would involve refrigeration.

REFINING PROBLEMS INTEREST OIL CHEMISTS

About one-third of the papers listed for the program of the Petroleum Division were not read, because of the absence of authors. Among the papers thus omitted were one by Roy Cross on the thermal balance in the Cross cracking process, one by Dr. R. H. Brownlee on a proposed new method for refining, and several others of what would appear to be considerable interest. This difficulty of absentee authorship is difficult of control, and there is growing support for the idea that even in the smaller specialized divisions the manuscript of a paper should be required in advance of a meeting, so that it could be read for the author, if necessary.

If all the papers listed had been read, the program would have been uncomfortably crowded, for discussion was so interesting and so extended that twelve papers filled three sessions.

The first paper, by R. E. Wilson and D. P. Barnard, laid to rest the gasoline dew-point controversy. Dr. Wilson explained certain errors that had been discovered in their equilibrium-solution method. When these are corrected by approximate calculations, the results agree with those determined by the direct method of W. A. Gruse.¹ The equilibrium-solution method as corrected is apparently too laborious and roundabout to be of much value. The importance of rational specifications for volatility of gasoline was emphasized, and discussion ranged about this point.

Interest in the program centered largely about two groups of papers, one covering the chemistry of the doctor treatment and other methods of refining light distillates for the removal of objectionable sulphur compounds, and the other group relating to automobile lubrication. The papers were by Wendt and Diggs and by Wood, Lowy and Faragher, and Dr. Wendt and Dr. Wood reported identical conclusions with regard to the action of the doctor solution on mercaptans. These investigators have shown that sweetening a distillate with doctor solution or hypochlorite may leave the total sulphur content unchanged, although the objectionable mercaptans are changed to the more inert disulphides. Dr. Wood reported detailed work with other standard refining agents. Both papers aroused much discussion.

Papers by D. P. Barnard and by C. M. Larson on crank case dilution brought out some active discussion on why a motor lubricating oil must be changed frequently. Opinion seemed to be divided as to whether a badly thinned oil or suspended road dust is the chief cause of trouble.

Dr. J. C. Morrell read a group of papers by himself and Dr. Egloff on the use of the Dubbs cracking process and on the perennial question of determining unsaturated compounds in petroleum distillates.

The officers of the division arranged a dinner for members, which was held at the Ithaca Hotel on Wednesday night. A round table discussion was held on methods of promoting research in university laboratories.

An apparently effective method for the photographic recording of flame propagation was outlined by F. W.



New Baker Laboratory

Stevens, of the Bureau of Standards. It is concluded from the use of this method that the rate of flame travel is directly proportional to the concentration of reacting gases present. Thus the mass law can be applied directly to these reactions. This was said to be true for explosions in automotive engines, for the standing explosion wave in the inner cone of a non-luminous flame, and for the study of anti-knock compounds.

Fifteen to 20 per cent of the heat of combustion is said to radiate from a non-luminous flame, but the percentage of such radiation varies with excess or deficiency of air, preheating of air and other factors, according to a paper by Professor Haslam and his assistants. Contrary to earlier notions, this percentage bears no simple relation to gas composition, flame temperature or residual products. Also, such flames seem to absorb all radiation if as much as 25 to 30 in. thick, so that greater thickness gives no increase in total radiant energy in a single direction.

The steaming of vertical retorts of the Woodall-Duckham continuous type was described by N. H. Memory, who claimed that this practice resulted advantageously up to 25 per cent increase in yield of B.t.u. in gas per pound of coal. This results in the addition of a certain amount of blue water gas after all the coal gas has been driven off, thus increasing the total gas yield. It was claimed that beyond this 25 per cent increase it is better to make the water gas in separate generators.

COKE COMPOSITION TO THE FORE

The softening temperature of most coals is sharply defined, but the plastic condition occurs over a varying temperature range depending on the rate of heating, according to a paper by T. E. Layng and W. S. Hawthorn. For this reason, no sharp solidifying or coke-forming temperature can be found except under closely defined conditions. The tests of these authors have not as yet been co-ordinated with the coking character of coals as judged by oven performance.

The residual volatile matter in an "undercoked" coke varies from 1.75 to 9.5 per cent, according to H. J. Rose and G. G. Desy. The temperature of further gas evolution, the character and quantity evolved and the unavailable gaseous heat units remaining in such coke give an excellent indication of the former thermal history of the coke in a cross-section of the oven. It was also shown that coke containing a moderately high percentage of volatile can hardly be uniform under ordinary conditions of coke-oven operation at the temperatures now usual.

¹"Weighted Index for Motor Fuels," W. A. Gruse, *Chem. & Met.* vol. 29, No. 22, pp. 970-1, Nov. 26, 1923. Comment by R. E. Wilson, vol. 30, No. 1, pp. 24-5, Jan. 7, 1924, and reply by W. A. Gruse, vol. 30, No. 9, p. 364, March 3, 1924.

Reconstruction in France

Marvelous Progress Made in Rebuilding the
Devastated Districts—Attitude Toward
Germany Changing

By E. J. Mehren

Vice-President, McGraw-Hill Co., Inc.

COMING to France after visiting Germany and noting there the transformation of spirit and the indications of reviving strength, one naturally asks whether the French, if aware of these developments in Germany, are formulating a policy that will work toward a peaceful solution of their differences. Do the French realize what has happened in Germany? Do they foresee the possible results of the growing enmity? What policy are they formulating that will, peacefully, meet the situation?

These are questions that force themselves on the visitor who, leaving Germany, comes to France.

MODERN POLICY DEVELOPING

The French do realize what has happened in Germany; they are watching Germany more closely than is any other nation. The result is what might be expected of men who do not blind themselves to the facts: a growing opinion that France must develop a harmonious relationship with Germany. The view is not yet very articulate, but Herriot's more conciliatory attitude, as contrasted with Poincaré's, is tangible evidence of the growing feeling.

The more friendly development, it is felt, should begin with commercial treaties, possibly commercial alliances. The German steel mills in the Ruhr, for example, can get their cheapest iron from Lorraine, now a part of France; Lorraine, on the other hand, needs German coal and can find the best market for its iron in the Ruhr. What more logical, then, than to come to agreement and to facilitate the co-working of these economically allied districts?

How much farther, if this step be accomplished, the relationship may and should go is hardly yet the issue. There is a feeling growing that a friendly relationship between the two nations must be worked out. Some—and they are of the school of Caillaux, the former Premier, who was banished during the war because of pro-German activities—favor the formation of a Franco-German alliance.

Of course there are opponents, like Poincaré and his followers, of any plan that looks with reasonableness upon relations with Germany. Poincaré, however, has lost ground. The last election showed that the French want to try a new method of dealing with Germany;



New Business Section in Lens



Row of Miners' Homes Near Lens

and the tide, judging by what could be learned here in Paris, is still setting away from Poincaré and toward the development of amicable relations.

Unquestionably such a relationship between these countries would be the best assurance of peace in Europe. This the French are beginning to admit. It is a hopeful sign.

FRANCE WANTS SECURITY

Repeatedly, in discussing these matters, it was impressed upon the visitor that France has no commercial jealousy of Germany, and that her sole desire is for security against German aggression. The reparations difficulty would long since have been adjusted had security been assured. This desire accounts, in part, for the Ruhr occupation, though the invasion was defended as a means of securing reparations payments. The Ruhr is the great steel center, the Pittsburgh, of Germany. In control of this district, France could prevent material preparations for war. It seems likely, however, that she will soon retire from the Ruhr [the London pact was concluded after this was written] and the question of security will be left to later conference, possibly under the auspices of the League of Nations.

But security she does want and until she gets it, through agreement with other nations or German alliance, it will be the controlling motive of French policy.

RECONSTRUCTION ACHIEVEMENT

France has done a mighty work in rebuilding the devastated regions. Four years ago I stood in Lens, on the site of the Hotel de Ville (the city hall), and surveyed in every direction the worst destruction I had seen in France. It was a city beaten flat, the streets obliterated, with no vestige of the pit heads that had once marked this, the richest of France's coal-mining districts.

This week I stood on the same spot. Round about was an entire new city, housing as many people as before the war. There were gaps here and there, where new buildings have not replaced the old; there is work under way in almost every street, on pavements, or sidewalks, or services; there are large buildings still under construction, new churches, and two banks; but for practical purposes it is a complete town, a town resurrected and at work—resurrected and at work where only desolation had reigned 4 years ago.

Striking as is the impression within the city of Lens itself, the impression is even stronger when one motors to the heights of Notre Dame de Lorette (where 100,000 French soldiers gave their lives during the war) and looks down upon the whole area. The landscape as far

as one can see is dotted close with new red-roofed towns, each surrounding the shaft of a single large mine. The impression would draw admiration from the dullest—admiration of the energy, the determination, the courage of the people of France.

Of course, the scars of war are still visible. Remains of trenches are found in Lens and in the country round about, while from the tippie of No. 11 shaft one can trace the wide swath of waste land—No Man's Land—where ran the main trench line, established when the English took Loos in the terrific fighting of September, 1915. Part of this trench line will be allowed to remain forever as a permanent memorial of the war.

Much remains, too, to be done in the way of completing the reconstruction. Sidewalks are missing in



Garden Village at Pit Head, Lens

large part. Many streets are unpaved or only temporarily paved. The churches and the municipal buildings are in hand only now or not yet started, the first efforts being put upon the recovery of the mines and upon housing. Probably 2 years more will be needed, in the Lens district, to finish the work.

MINE RECONSTRUCTION

To reinforce the general observations about progress, a few statistics will be given. The company operating the Lens concession (sixteen mines) will be taken as an example. The Lens company before the war employed 12,300 men underground and mined 370,000 metric tons of coal per month. On May 1 of this year 10,458 men were at work underground, and the monthly tonnage was 175,000 (working conditions are still quite unsatisfactory). Of the 8,300 houses for workmen, 7,490 have been rebuilt and the population of the mine towns (32,250 in 1913) is now 30,284. Thirteen out of the twenty-three destroyed working shafts have been repaired, the headworks completed and put in service, and so have eight out of the twelve ventilating shafts. Of 35 million cubic meters of flooding water 31 million had been removed.

For French coal mines as a whole, the reconstruction figures show even greater progress than that of the Lens company. Of 200 mines destroyed, 145 are again producing coal, some of them, however, with temporary installations.

In the rebuilding of the tipples, electric substations, wash-houses for the workers and the other necessary structures the best construction and the latest equipment have been employed, so that the Lens area has the unique distinction of a whole district modernly equipped. The plan layouts are impressive for their substantial character and the entire absence of the timber struc-

tures and shabby buildings so characteristic of our mines. All the buildings are of brick, both the mine structures and the homes for the workers.

GENERAL RECONSTRUCTION

This picture of reconstruction is matched in every part of the destroyed area; in many districts, of course, there were no industries, so that this side of the Lens development is missing. For the whole of the destroyed region the figures stand as follows:

Progress of Work of Reconstruction in Devastated Regions

	Total Work to Be Done	Finished Jan. 1, 1924
Houses and farm buildings.....	741,900	605,900
Farm land to be reclaimed, hectares.....	1,923,000	1,788,000
Factories to be rebuilt.....	22,900	20,872
New roads, km.....	58,697	42,360
Railroad and other engineering structures.....	6,025	4,800

Finally, the population of these areas, which had before the war been 4,690,000 and which had declined to 2,075,000 at the time of the armistice, has now risen (figures of Jan. 1, 1924) to 4,253,000.

One other comment needs to be made that the appreciation of the French accomplishment may be complete: France has, herself, raised practically all the money required for this reconstruction. This is a great accomplishment and one that explains the French insistence upon reparation payments. She was the chief sufferer and if her budget is now unbalanced it is because of her reconstruction charges. No wonder, then, that Poincaré had following in a people that have placed upon themselves this very heavy burden. Let it be remembered, too, that in the wrecking of these regions France lost heavily of her income, for while the destroyed area was only one-fourteenth of the whole of France, it produced one-fifth of the income from taxes. Yet with these handicaps—diminished taxation, no outside financial help and a war-tried people—France has rebuilt her devastated regions. For practical purposes, the task is done. In 4 years her destruction has been repaired. Full economic and social life has been restored in territory wrecked beyond any other in history.

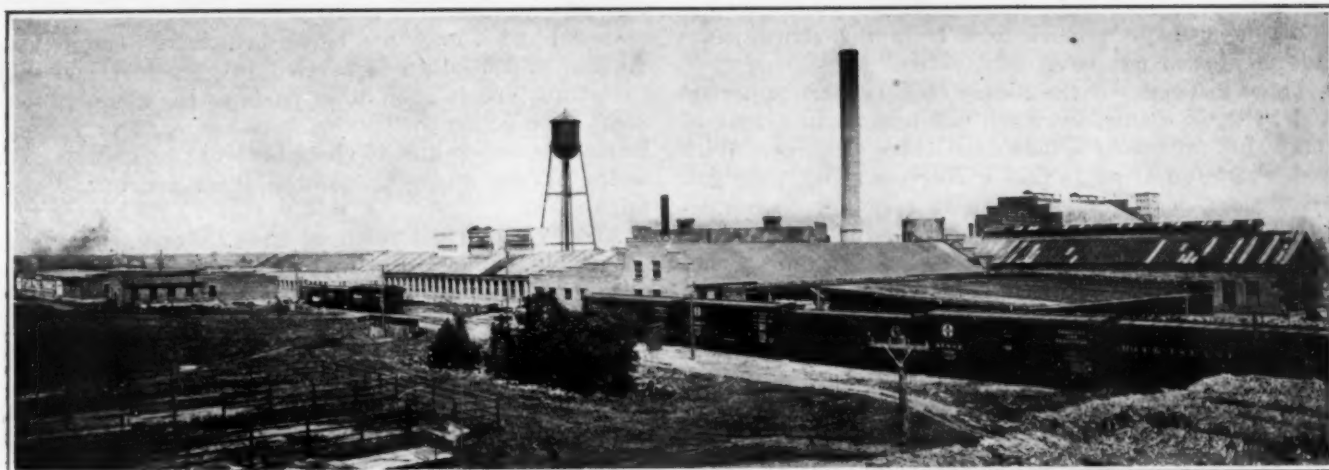
As I wandered over this scene of reconstruction this week, the contrast with conditions of 4 years ago came repeatedly to my mind. Particularly did I recall a sign that I had seen in Lens in 1920. On a mound of stone and brick was this slogan in French, "Lens will rise again."

The sign has disappeared; so has the heap of brick and stone. Instead is the Lens that had been foretold, the new Lens—sign of the courage, the persistence, the indomitable energy of the people of France.

Paris, Aug. 15.

South Africa Seeks Oil Supply

There appears to be a strong desire on the part of South Africans to develop the potential oil resources of the Union, and progress in that direction seems likely to be much more rapid than corresponding measures in the United Kingdom. This activity in South Africa is taking the form chiefly of organizing companies to exploit the oil-shale deposits known and in prospecting for other deposits. The hope of finding liquid petroleum in commercial quantities is not great, and the efforts that are being made are devoted mainly to the exploitation of more certain resources.



General View of Emerson Carey Fiber Products Co. Plant

Making Paper From Wheat Straw

A Glimpse of the Activities at the Plant of the Emerson Carey Fiber Products Co., Hutchinson, Kan., Indicates the Simplicity of the Lime Cooking Process for Unbleachable Pulp Production

By C. A. Lovell

Hutchinson, Kan.

STRAW undoubtedly is a material of promise for making paper products. For several years it has been used for making such relatively crude products as board, and at present a plant is building in Canada for production by the De Vains chlorination process (see *Chem. & Met.*, vol. 30, p. 262) that turns out a high-grade pulp for fine papers. Straw pulp has also been prepared by the soda process that gives a clean white pulp, but here the labor entailed in freeing the straw from foreign material is considerable.

The manufacture of strawboard has become a sufficiently well-established industry to make its technology worthy of consideration. As far back as 1904, 304,585 tons of straw was used for making this product. It will be evident that its manufacture on a much wider scale would be entirely feasible were the market wider. Rye, wheat or oat straw may be used, desirable in the order named, and it is estimated by the government that 70,000,000 tons of these cereal straws is produced annually.

For the purpose of outlining the procedure followed, approximately the same in the thirty-odd plants producing, it is proposed to focus upon the Emerson Carey Fiber Products Co., at Hutchinson, Kan.



Reserve Storage Piles of Straw Each Containing 1,000 Tons

This plant is capable of making about 50 tons per day, or, say, 18,250 tons per year; thus requiring not in excess of 32,000 tons of straw. The potential supply of raw material in the county in which it is located is barely scratched. Since straw can be drawn profitably from a radius of 50 miles, the total amount used is almost insignificant. Five square miles could doubtless yield all the straw that a single plant of like capacity would need.

AN OUTLINE OF THE PROCESS

The several operations in making paper from straw fall naturally into five divisions—viz., the handling of the raw material, its preparation for pulping, the pulping process, the manufacture of the paper and the utilization or disposal of the finished product.

Straw is received at the plant in two forms, loose straw and baled straw. Loose straw is relatively undesirable, because it must be used at once. It cannot be stored without burdensome expense and loss. Baled straw, on the other hand, may be worked up immediately, or it may be placed in reserve storage piles. Whether loose or baled, the straw is taken into the plant by an inclined conveyor, the wire ties of the baled material being removed by hand at the point of loading onto the conveyor. By this means the straw reaches the upper story of the rotary or cooker house, where it discharges to a horizontal conveyor that dumps it at any desired point along its run in the loft above the cookers.

PREPARATION FOR PULPING

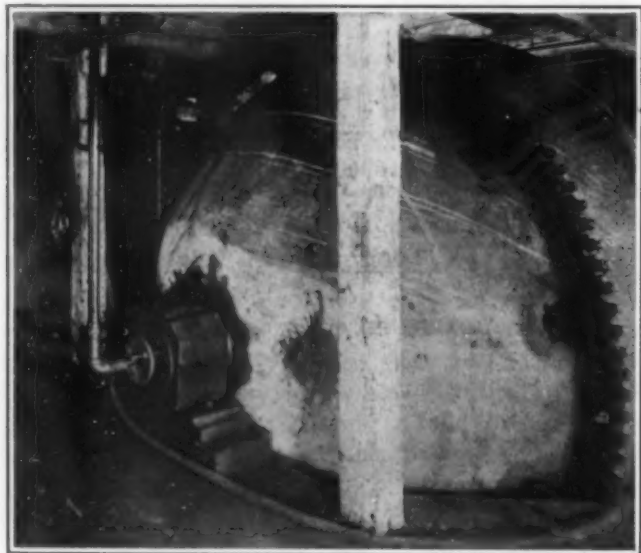
The discharged straw is placed into the cookers through a hole in each provided with a cover held in place by staybolts, the loading of the cookers being a manual operation (the workmen using ordinary pitchforks and tamping the material with a long bar). No

effort is made to remove dust from the straw, since this is washed out later.

There are eight of the rotary cookers, each spherical and 14 ft. in diameter. Each will hold about 6 tons of straw, but ordinarily 5 tons constitutes a charge. With each charge of straw, a cooker receives about 5,000 gal. of "liquor," a solution of lime at very low concentration. This is the only reagent employed in this process.

Lime is received at the plant in bulk, in lump form. The lime for a batch is measured rather than weighed, the usual proportions being about 1,750 lb. to 5,000 gal. of water to 5 tons of straw. The exact amount of lime and water varies slightly, being dependent upon the moisture content of the straw and upon the percentage of intercellular material that it carries. Both of these factors change in a small degree from year to year; and the water content is altered by climatic conditions.

In practice it is found impossible to give a cooker its full charge at one operation. First the shell is filled with straw, as much being put in as may be, and the liquor is added. The cooker is then set in motion, revolving through the action of a pinion upon a rack surrounding the periphery of the cooker. Steam is admitted through the line that enters the cooker interior at the hub or shaft, the steam being built up gradually from a low start until at the peak of the cooking operation it reaches 40 lb. The combined action of the lime water and heat soon causes the straw to settle. The cooker is then stopped and more straw is added,



Rotary Ellipsoidal Digester Holding 5 Tons at a Charge

this being repeated at intervals until the full charge is obtained.

It requires from 8 to 10 hours to fill the eight cookers; and 12 hours of cooking is needed to complete this stage of the preparation. A day of 24 hours thus serves for the cooking of about 40 tons of straw (eight cookers times 5 tons each equals 40 tons per 20 to 22 hours). The power consumed is 75 hp. over the entire day, exclusive of the steam used in the cookers.

Wheat straw carries little but siliceous intercellular material, it being considered for all practical purposes as pure silica. There is also, however, other mineral matter, such as manganese, zinc, carbon, etc., in small percentages; but the main problem is the loosening of the silica. This frees the fiber of all intercellular

material and it may then be washed clean. The greater portion of the silica is carried in the stem nodes of the straw, and in such other parts as the almost-woody shaft upon which the kernels were borne. The cooking-house foreman is able to check his work by testing stem nodes of the straw by pulling them apart with his fingers.

After cooking the required time the material is discharged from the rotaries to a conveyor that carries it to the stock pit. It is now heavily impregnated with moisture, resembling the material of a dung-hill in color, consistency and the characteristic odor which it gives off. The percentage of water remaining in the cooked material is not gaged by analysis. The skill of the cooking-house foreman is sufficient, he seeking



Cooked Straw, Dropped Nearly Dry From Digesters

to have the pile in the stock pit just wet enough so that a very small quantity of the liquor will drain from it.

The beaters in which the raw pulp is disintegrated are of the conventional tub shape, having a washing roll at one side and a heavy metal beating roll at the other side. Each receives 1,500 lb. at a charge.

The washing roll is covered with brass screen cloth of 40 mesh per sq.in., and on the interior it has a series of baffles. This turns upon a shaft that communicates with a pipe leading away from the beater and discharging into the sewer. Water is squeezed out of the mass, forced through the screen and into the interior of the roll, whence it is guided by the baffles to the discharge pipe. At the completion of the washing, the beater roll is dropped to its working position, where it continues to revolve $1\frac{1}{2}$ to 2 hours, making a total of 2 to $2\frac{1}{2}$ hours the stock remains in the beaters. All water used in the beaters is warm, about 80 deg. F., and in cold weather it is sometimes necessary to preheat the machines. For this purpose each is fitted with steam pipes.

Except for shortening the fiber in jordans, this completes the preparation of the straw pulp. The further process is essentially one of paper making; the forming, drying, slitting and rolling of the sheet needing but little mention here, as they have been dealt with in detail in previous articles on paper making in *Chem. & Met.* Except for a few minor details, there is little difference between the making of paper from straw and making it from wood pulp, rag fiber or other pulp.

Outside of the straw and power, water is the one essential of a strawboard plant. It is the solvent that is used to free the fiber of foreign matter; it is likewise the vehicle that transports the pulped fiber through every stage up to the point where it becomes a formed strip of paper, able to pass around the drying rolls without outside aid. The Hutchinson plant is fortunate in respect of water, being located in the Arkansas River valley, where there is an underflow rated by government agencies as the second largest on the American continent.

Wells can be obtained by digging 12 to 20 ft., while a literally inexhaustible supply is had by going down 40 to 50 ft. This is the depth range of the ten wells of the Emerson Carey Fiber Products Co. Some



View of Cylinders at Wet End of Board Machine

are 12 in. in diameter, others 16 in. In all, a total of about 2,000,000 gal. of water is pumped daily, and so plentiful is it, with such a short distance of lift, that no effort is made to save water once used.

It is cheaper to pump new water than to recover the old; and water escaping from the paper machine carries so negligible a percentage of fiber that even it is not treated for recovery—although upon occasion some of this escaping water is sent to the beater room for service in washing the pulp. When that is done, the fiber that it carries with it may or may not be saved. Such a saving, when it results, is incidental. The problem of fiber recovery has not made itself felt up to the present time in this industry as in others that are closely related; and with so much raw material available it is thought probable that for some time to come it will be cheaper to make fiber than to treat the spent water for the recovery of its small content.

Upon occasion chemical treatment is necessary to prepare strawboard for special uses. The chief reason for using size is to render the paper more impervious to water and to enable it to take a smoother finish in the calenders. When required, a rosin-alum size is used, the alum acidifying the mass so that the rosin will be retained. The amount of alum usually required is 40 lb., and that of rosin 25 lb., to 1,500 lb. of cooked stock. Both alum and rosin are added in the dry state during the beating of the pulp.

The power consumed in the manufacture of a ton of strawboard figures approximately 150 hp. over 24 hours.

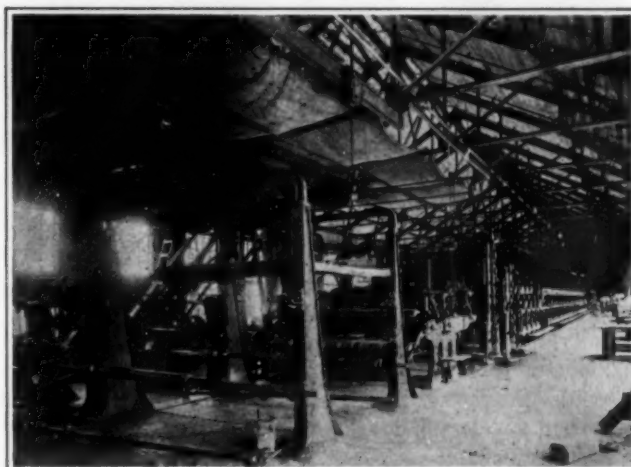
On the average, 1½ tons of straw is required for each ton of finished strawboard.

The paper strip contains from 90 to 95 per cent moisture as it goes onto the machine, and is dried down to a moisture content of not more than 12 per cent—9 per cent is considered the best practice. Sixty-six 36-in. drying rolls are used, being heated with exhaust steam at 28 lb. Except for short and infrequent periods, the climatic conditions at Hutchinson are such as to make condensation within the drying room of little consequence. A tarpaulin (which may be seen in one of the illustrations) is suspended over the rolls of paper as they are being taken off the machine to give protection against falling condensate. Roof ventilators, which are immediately in front of the water tower in the panoramic view of the plant, serve to remove the moisture-laden air above the drying rolls.

The machine in use trims 102 in. A speed of 82 ft. per minute gives a capacity of 25 tons per 12-hour shift. A higher speed is possible but not practicable.

MANUFACTURE OF CHIPBOARD

It will have been noted from the foregoing description that whereas the paper machine will produce 50 tons per 24-hour day, the straw cookers turn out only about 40 tons. That would leave the paper machine idle about 20 per cent of the time. Such an idle period is avoided by keeping the room and the paper machine



Dry End of Machine, Showing Colanders and Winding Apparatus

busy making so-called chipboard from waste paper stock. Chipboard is the material from which such containers as shoe boxes are made. It is also met with in wallboard.

Waste paper comes to the Hutchinson plant from a rather wide area. It receives no cutting or shearing previous to entering the beaters, being fed directly to these machines by hand. With one exception, no effort is made at sorting.

The waste paper receives no washing preliminary to beating—and little of the beating itself. Having been pulped previously, it disintegrates quickly and becomes pulp again under the combined action of the beater roll and the dissolving hot water. Ink is not removed, as the end sought is not the making of white paper. On the other hand, lampblack is frequently added to obtain the requisite gray color.

Since mixed waste paper gives a rather coarse sheet, containing as it does a heterogeneity of rag content, wood

pulp and other paper, sorting is necessary when chipboard is to be lined. Newsprint paper (ordinary newspapers), on the other hand, gives a much finer pulp and sheet. Chipboard is often called for with a body of the coarser material and having one or both sides coated or "lined" with the newsprint product. Lining is accomplished by placing this pulp in the end vats of the multi-cylinder machine. In this way the outer facing of the product is made of different composition than the main body.

The manufacture of wallboard is essentially a matter of taking the desired number of plies and gluing them together under pressure. The Hutchinson plant includes a wallboard factory—and in addition large quantities of chipboard are made for other wallboard manufacturers. On the day of the writer's visit for the purpose of obtaining material for this article the paper machine was running on chipboard that would later become the two outside layers of plaster board, a wallboard made by placing a layer of plaster between two layers of the "chip." In this case one side of the chipboard was being lined with a gray coating of pulp made from newspaper stock, while the remaining portion of the sheet was the mixture obtained from all kinds of paper.

The manufacture of chipboard from waste paper was in effect an addition to the purpose for which the Hutchinson strawboard plant was erected. The use of straw must also appeal to the visitor and the engineer as the most interesting part of the plant's work. Seeing the great piles of straw awaiting their turn to be fed into the cookers, one is quick to realize that here again the chemical engineer has accomplished a task that once seemed beyond all possibility. He has saved for further usefulness a product that only yesterday was the waste of the wheat fields. He has taken up where the agriculturist left off, snatching a great tonnage of straw from the flames and directing it toward a new service to mankind.

He still is not done, however. Good book paper can be made from straw. The only present drawback is the cost of the process as compared with the cost of making book paper from other materials. But as these other materials disappear, and as the making of straw paper is further developed, another chapter in the story may have to be written.

The hewing out of the data for that story is the future challenge thrown before the engineer by the



A Glimpse of Beater Room

wheat fields of the West. While the work progresses, we may find consolation in the thought that our dwindling supplies of suitable wood pulps will not leave us devoid of paper. When the need arises the ingenuity of the technologist will evolve a method of making straw paper cheaply, just as he has already evolved a method of making strawboard cheaply.

Opportunity is here taken to express appreciation for the kindly assistance rendered by all officers and employees of the Emerson Carey Fiber Products Co. in the collection of data and photographs for this descriptive article. Special mention should be made of Charles Carey, general manager of the company; R. G. Streeter, advertising manager of the Carey Industries; and Messrs. Stewart and Belford, all of whom furnished many helpful suggestions.

Nitrogen Activation by Explosion of Carbon Monoxide-Air Mixtures

Nitrogen is activated in the explosion of carbon monoxide mixtures at high initial pressures, according to Prof. W. A. Bone, F.R.S., who described his research work in this connection at the recent meeting of the British Association for the Advancement of Science.

It has been discovered that nitrogen exerts a peculiar energy-absorbing influence under these conditions which is not manifest at all when corresponding hydrogen-air mixtures are similarly exploded. The observed facts are explained on the supposition that there is some constitutional correspondence between CO and N₂ molecules (where densities are identical) whereby the vibrational energy (radiation) emitted when the one burns is of such a quality as can be readily absorbed by the other, the two thus acting in resonance. The nitrogen thus becomes chemically "activated" in carbon monoxide-air explosions at high initial pressures, and in such state is able to combine with oxygen more readily than does nitrogen which has merely been raised to a correspondingly high temperature in a hydrogen-air explosion.

The influence of varying initial explosion pressures up to 100 atmospheres upon the said "nitrogen-activation" was shown, and the bearing of the results upon the problem of nitrogen fixation discussed.

Professor Bone was not especially optimistic about the immediate commercial possibilities involved as a result of this work, but he believed that when it becomes necessary to replace the natural sources of fertilizer nitrogen by artificial fixation, these considerations may be of considerable significance.



Fabricating Egg Case Fillers From Strawboard

The Advantageous Use of Continuous Operation

Developments in the Use of Hydrometallurgical Equipment for Continuous Mixing and Decantation That Result in More Economical Methods of Production

By J. V. N. Dorr

President, The Dorr Co., New York City

IT IS NOW nearly 10 years since I read a paper at the Philadelphia meeting of the Institute discussing the application of Dorr methods and apparatus used in hydrometallurgy and chemical fields. At that time they were practically unknown except for the cyaniding of gold and silver ores and in a few places in water recovery from copper ore tailings. It may be of interest to the members to discuss some of the applications that have been made and the difficulties overcome and results obtained. Before doing so, I should like to give a brief résumé of the methods and apparatus that are used and some comments on their further development.

The continuous operations with which we are concerned are:

Sedimentation, or the separation of a dilute or thin suspension of finely divided solids in liquid into clear liquid and a product so thick that often it will barely flow.

Classification, or the separation from a suspension of the quick settling particles from the relatively slow settling particles and the bulk of the liquid.

Dissolution of a portion of finely divided solid suspended in a solvent or a chemical reaction in which one product is a solid.

SEDIMENTATION

Continuous sedimentation is used as a single step where any separation of a portion of a liquid from suspended solids is required both for that purpose alone and as a preliminary to complete separation by filtration. Counter-current decantation or a series of sedimentation operations is also used for complete separation. Classification is used directly to make two or more final products, and in closed circuit grinding wherein the oversize or unfinished product of classification is returned to the grinding medium it is used to produce a single desired product most efficiently.

Much has been done to determine the laws of sedimentation in the last few years and many theories have been advanced. At the time I first became interested metallurgical ideas were that settling capacity was largely a matter of length of overflow weir. We early found that on metallurgical pulp it was largely a function of area, while the sanitary engineers felt and still feel and talk entirely of a period of detention. Our present conclusion is that there are a great many factors entering into the question and that it depends largely on the nature of the material to be settled and the desired density of settled product.

With a stable solid such as a metallurgical pulp the settling rate that determines the rate at which clear liquid can be overflowed is a constant under any given condition, hence area is the principal factor; but in settling very dilute suspensions or precipitates formed

by coagulation, the rate changes as flocs form, and thus time of detention becomes important and justifies largely the position of the sanitary engineers.

The evolution of sedimentation equipment during the past 10 years has continued with variations designed to meet different problems presented. The tray thickener has been greatly improved and at present we use two types for most purposes. The open type has one feed, one pulp discharge, with regulated overflow from each tray. The connected type has one feed, but a separate pulp discharge from each tray and the same regulated overflow. This has somewhat greater capacity in many cases. The size of units has increased to 75 ft. for tray thickeners and 200 ft. for a special design of unit thickener.

CLASSIFICATION

The principles involved in classification are more intricate than would be indicated by saying that it was the mechanical removal of the quick settling particles dropping from a dilute suspension flowing in a settling trough. While in many cases this is true where dilution of the overflow is 5 to 1 or greater, we have found also that the jiggling action of the classifier rakes would allow also a coarse separation at dilutions of 3 to 1 or less, thus making the coarse material act as a jiggling bed and throw over the finer sand that would drop out at greater dilutions.

The bowl classifier, a combination of a small, shallow thickener and the usual classifier, has been developed, and can be used to make a separation at 350 mesh on very dilute feeds by virtue of its absolutely quiet pool and large settling area. On the other hand, using a thick feed and emphasizing the jiggling action in the rake compartment shown, it has proved able to make a 60-mesh separation with great efficiency. From the 100-ton classifier of 10 years ago we have gone to 1,500-ton units for the large copper properties.

DISSOLUTION

Experience has shown that continuous reactions are feasible and give much closer control over the nature of the precipitate formed than intermittent treatment. The conditions of precipitation, as is well known, affect very greatly the nature of the product precipitated, and this has given opportunity for regulation in a way that has made the difference between success and failure in some cases.

BARIUM SULPHIDE AND LITHOPONE

Most of the barium sulphide produced at present is used in the manufacture of lithopone. In general these sulphides are somewhat disagreeable to handle and any labor-saving devices are of value in reducing labor turnover. With the general introduction of the continuous kiln for barytes reduction, continuous leaching and washing obviously is advisable. Six chemical manufacturers have to date adopted the continuous system of settling and washing for barium sulphide. Continuous hot settling makes possible the production of stronger sulphide liquor and all the other advantages of continuous operation are realized.

Usually the continuous kiln discharges directly into a rotary leaching drum, where it is mixed with the weak liquor overflowing the second thickener. The four-thickener series replaces the old-type percolation tanks and discharges to waste a residue practically free from soluble barium salts. Since the solution flows

continuously through all pipe lines, freezing difficulties are reduced or eliminated and an increased yield of a definite quality product is made possible.

Equipment quite similar to the above may also be used for preparation of the zinc sulphate solution for lithopone. For the finished lithopone Dorr installations are in use in various steps of the operation. For dewatering, the crude precipitate, thickeners are used; for grinding the calcined product, bowl classifiers or hydroseparators are in closed circuit with a tube mill; for treating and bluing the ground material, Dorr agitators are frequently used, while the finished product is washed free from soluble salts and dewatered before filtration in a C.C.D. series of thickeners. Due to the size of the lithopone industry and the high dilutions at which the material is handled, the continuous method shows very large savings in power, labor, etc. Of more importance than the monetary saving is the superior quality of the finished lithopone produced by the continuous method. Closed circuit grinding in the wet condition seems to produce a texture that cannot be duplicated by dry methods, while the bowl classifier and hydroseparator make possible an extremely satisfactory degree of separation. Continuous operation also insures a uniform product at all times.

PHOSPHORIC ACID

The manufacture of phosphoric acid, superphosphate and phosphate salts offers an admirable field for the use of continuous digestion and C.C.D. washing. A number of successful installations have proved this statement. Labor requirements have been reduced from two to five men per shift; extraction has been improved 6 to 8 per cent and the washing efficiency and over-all yield have improved. Repairs, filter cloth, less floor space, etc., are additional arguments in favor of continuous operation.

The production of stronger liquors is again perhaps responsible for the greatest individual saving. Most filtration or intermittent settling plants produced a liquor containing from 12 to 18 per cent P_2O_5 , while 22 per cent or 30 deg. Bé. solutions are easily obtainable with C.C.D. equipment. As these liquors must be evaporated to 50 deg. Bé. for superphosphate manufacture, this represents a possible \$25,000 saving per year for a 40-ton plant. In addition the higher Baumé liquor means less calcium sulphate in solution to be got rid of during evaporation.

CAUSTIC SODA

To produce caustic soda by the lime-soda ash process it is necessary for economical operation to recover practically all the caustic liquor from the calcium carbonate sludge formed. A counter-current series of thickeners has solved this problem satisfactorily. In general the cost of washing the solids in a thickener series is lower than by filtration and in addition filtration of the strong caustic liquor gives rise to other difficulties, such as materials of construction.

For a complete continuous caustic plant, a rotary lime slaker in open circuit with a Dorr classifier is good practice. The classifier removes from the system at once grit and any particles of unburned lime. For the causticizing reaction a series of three agitators serves to give continuous operation and a C.C.D. thickener series following separates the strong caustic liquor from the carbonate sludge and washes the latter free from soluble salts. The actual conversion varies with

the concentration, but a 99.5 to 99.9 per cent washing efficiency serves to recover practically all the caustic actually formed.

Again, the continuous method saves labor, floor space, initial investment, and gives increase in over-all recovery. This layout is satisfactory for small recausticizing operations where it is desired to convert waste carbonate liquor to caustic with little expense and practically no attention. By removing the gritty particles by means of a classifier early in the operation the waste calcium carbonate is of such fineness that it often finds a sale as whiting.

SALT OR CRYSTAL WASHING

A number of years ago we installed a multi-deck classifier at the plant of one of the large electrolytic caustic manufacturers to receive the underflow from the caustic evaporators. The classifier was fed a dense sludge of sodium chloride in caustic solution and it was desired to remove the last traces of caustic from the salt with a minimum of water. Using but $\frac{1}{2}$ ton of water per ton of salt washed, the caustic content of the dry salt was reduced to a few tenths per cent. This installation led to others, and more recently we have installed other classifiers for removing other crystals from their mother liquors and washing these before centrifuging or drying. In connection with a continuous crystallizer this makes a very satisfactory arrangement, but the classifier may as well receive the crystals directly from the base of a continuous evaporator.

Asphalt Industry Active in 1923

Both the quantity and the value of asphalt and related bitumens produced in the United States increased in 1923, according to a statement issued by the Department of the Interior, based on figures compiled in the Geological Survey.

The sales by producers were as follows: Native asphalt and related bitumens, 400,236 short tons, valued at \$2,885,631; asphalt made from domestic petroleum, 995,654 short tons, valued at \$13,060,174; asphalt made from Mexican petroleum, 1,378,722 short tons, valued at \$16,840,045.

The imports of ozokerite and other mineral waxes were 4,856,357 lb., valued at \$213,407, a decrease of more than 40 per cent in both quantity and value from the imports in 1922. The exports of unmanufactured asphalt were 72,628 short tons, valued at \$1,500,869, an increase in both quantity and value. The exports of manufactured products were valued at \$1,154,976.

Test Developed for Waterproof Paper

In connection with testing the water resistance of waterproofed papers such as case lining, a method has been devised at the Bureau of Standards which consisted of folding the paper box-shape, filling with water, placing on a piece of ground glass which is laid over a black surface and noting time of water transudation as indicated by appearance of a film of moisture on the ground glass. There is a demand for such a test as regards waterproofed paper board.

A modification of this method was devised which consists in securing the specimen to the bottom of a glass cylinder with paraffine and filling the cylinder with water. Tests of a number of paper board samples waterproofed with asphaltum showed that satisfactory results can be secured in this manner.

How Silica Cement Is Made

Discussion of the Problems of Technology and Production of an Important Commodity That Must Meet Difficult Industrial Specifications

By Philip H. Jung

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AMONG manufacturers and users of silica cement it is becoming more clearly recognized what an important bearing silica cement has on silica brick. With the most progressive minds in the industry, it is no longer the sideshow of the silica brick plant.

Silica cement or silica dust, as it is sometimes called, is the nearest approach to an ideal mortar for laying up silica brick. When carefully made and up to specifications, it has a degree of refractoriness only a little less than that of silica brick. It is sufficiently plastic to be workable at ordinary temperatures, assuming its cementing properties at high temperatures, and is fine enough under practical conditions to insure "adequate suspension" in water for 24 hours. The term "adequate suspension" is used advisedly and does not mean that the particles of silica cement remain in suspension, but that at the end of 24 hours it has not settled sufficiently to cause the heavier particles to form a solid mass or cake at the bottom. The latter constitutes the important "pail test" for the use of this material in laying up coke-oven silica blocks.

Silica cement is made from crushed silica "bats" and a high-quality plastic clay. In some works raw silica rock or ganister is added. The use of the latter in this mixture is questionable. Opponents of it call attention to the fact that the introduction of unexpanded material would cause an expansion later on when the material was being used, but on the other hand those that use it counter with the fact that clay, being very plastic, might show excessive shrinkage on heating and an expansive element would counteract this. Our personal view is that the introduction of ganister is unnecessary. In the first place, the amount of clay added is small as compared with the amount of silica bats, this difference being more marked when ganister is added, as the ganister displaces some of the clay, so that the shrinkage is not great enough to cause concern. In the second place, the use of a third material complicates matters under practical conditions of manufacture.

CLAY

The selection of the clay used is important. As mentioned above, it must be plastic and sufficiently pure to insure a high fusion point. A low moisture content is also desirable. The disturbing elements in a clay from a refractory standpoint are iron and alkalis and sometimes sulphur. Iron can be seen by its brown discoloration, and an excess of sulphur usually manifests itself in very small particles of pyrites, which can be detected on close examination. But visual examination cannot reveal the third and worst of these from a refractory standpoint—namely, the alkalis. Certain plastic clays, excellent in other respects, have an alkali content as high as 3 per cent. Plastic clays by their very nature seem singularly receptive to impure washings from

above, and this, together with the fact that they are usually found near the surface of the ground, makes it difficult to strike comparatively pure clay and it does not pay to wash such material, as the price does not warrant it.

The following is a typical analysis of the clay which is used:

	Per Cent		Per Cent
Silica	58.00-70.00	Sulphuric anhydride	None-0.50
Alumina	20.00-28.00	Alkalis	0.75-3.00
Iron oxide	0.75- 2.50	Loss on ignition	4.00-7.00
Titanium oxide..	0.50- 1.50	Fusion point—	
Lime	0.10- 0.50	Orton cone, 26-31	
Magnesia	0.10- 1.00		

The maximum figures in the right column for impurities are the limits allowed for making first-class cement. A little more alkalis or iron would drive the fusion point down to Orton cone 17. Above 70 per cent silica the clay usually feels sandy, and in that case too much would be necessary to give the required plasticity. When this is mixed with crushed bats and the two pulverized together to get a homogeneous mixture, the alumina content should not be more than 6.5 per cent or less than 5 per cent. The correct ratio of silica to alumina in cement would mean a final mixture of 20 to 25 per cent clay and 75 to 80 per cent bats. From the standpoint of economical operation, if a 20 per cent clay mixture is sufficient to give proper plasticity, a 25 per cent mixture would simply mean an unnecessary expense, as the clay is worth more than the bats.

One of the chief obstacles encountered in the manufacture of silica cement is the fact that clay when unloaded at the plant is wet and from the very nature of the material it is difficult to dry in large quantities and in a minimum length of time. It usually contains about 18 per cent moisture, which should be reduced to about 3 per cent before it can be mixed without adhering to the machinery. The mere presence of wet clay during the course of manufacture cuts down capacity in an almost unbelievable manner. Various methods of drying the clay have been proposed. These include drying by means of waste heat from the kilns driven over or under the clay, or both; air-drying; drying on heated floors, and finally drying on an open grate under which the heat circulates. Periodically the grates are operated to shake down the dried clay, the moist clay above settles on the grate and the process is thus continued. Experience has proved that where storage space is limited and no mere mechanical device is wanted two or more floors may be used to store clay, permitting a circulation both above and below. However, this method is not supposed to give the capacity that some methods utilizing mechanical means do (Fig. 1).

The next question to consider is the size of the clay lumps to be introduced after drying. When the grinder will not take large lumps of clay, means must be pro-

vided to reduce the size, usually in an ordinary jaw crusher provided the clay is sufficiently dry.

Crushing the bats is important. A jaw crusher with manganese steel jaws is more effective than a rotary crusher, because of its resistance to abrasive action. In order to prevent material from breaking up into long slivers and thin pieces, two methods have been devised where a jaw crusher is used. First dies are corrugated in such a manner that the hill on one die lines up with

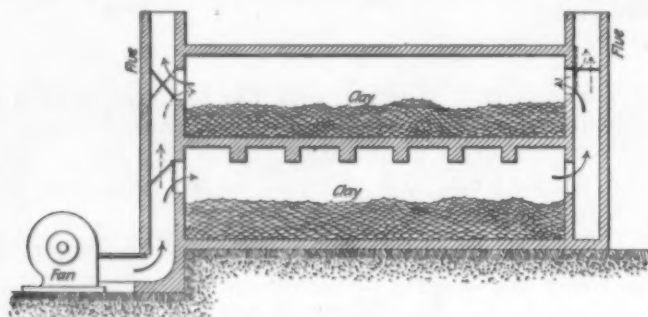


Fig. 1—Clay Drier

the vale on the other die, and second, near the bottom of the swing die, the face is relieved so as to bring it approximately parallel with the stationary die, permitting the material to be acted upon more than once.

MIXING

A difference of opinion prevails as to the method of mixing. The first method is to crush each material separately, storing them in a bin and then mixing and grinding them. The second method is to crush all material previously mixed in proper proportions and then grind it. The objection to this is that the clay has a tendency to become segregated on crushing, thereby giving no assurance of a homogeneous mixture. Where the first method is employed, it is customary to use so-called disk feeders, one for each kind of material used. The addition of ganister, requiring another feeding device and control, would vastly complicate matters. The feeders are stationed opposite one another and the material is fed into a common pit and then hoisted up by elevators to another bin or else is immediately ground after being hoisted. The amount of material is controlled by gates above the revolving disks. These gates are in the form of a cylindrical shell, one end of which is fixed and the other movable. The movable end can be set up one, two or three notches as the case may be, thus determining the amount of material that will be forced through the orifice onto the plate or disk. The chief reason for the difficulty encountered in controlling the mix lies in the clay. Before entering the feeder from a bin the clay is crushed and the large lumps are separated by means of parallel bars through which only smaller lumps and smaller pieces can travel. Coarse screens would be ineffective here, as the material soon clogs them up. Nevertheless, when the clay reaches the feeders, it varies from pieces a little smaller than first size down to a fine dust, and sometimes larger pieces get in by accident. Naturally the amount of material going on the plate would depend on the size of the lumps. All dust would give the largest amount and a larger proportion of lumps would give less. Furthermore, at times the entrance is so clogged that for a time nothing passes. This being a serious matter, one of the mill hands sees that the feeders are working freely, and in case of a stoppage he prods the material in the

shell with a bar. In case of the bats, this trouble is not experienced, but the wear and tear is greater on the disk. The abrasive action causes a circular groove to be cut into the plate and in the course of time, if this plate is not replaced, the bats will cut clear through and the outer rim will drop off.

PULVERIZING

This mixed material can either be passed directly to the pulverizing machine or to a bin prior to being pulverized. The latter is preferable, as it helps in controlling feed to the pulverizing units. Ring-roll pulverizers are used in most plants, although a few still use dry pans.

SCREENING

The common practice in this industry is the use of inclined flat screens with tappers. These screens may have either a single screen-face or a scalper and other coarse screens to relieve the fine screens of some of the burden. In spite of the precaution in using two or more screens, the wires are worn through in an astonishingly short time. Furthermore, this wear and tear is increased by the action of the tappers, which sometimes loosens the screen from the frame. This fact has led to an investigation of a more serviceable method of screening. Of recent years a new screen has been put on the market that operates by the use of vibration by electrical means in contrast to the jolting action of the tappers. Moreover, the use of an air separator in this industry has been discussed. This latter system seems to be ideal if it can be worked out.

The chief objection to any separator using inclined screens is the necessity of changing frames to secure different degrees of fineness in the product. While the operation seems to be simple, it is not so in actual practice and entails shutting down the equipment. In theory, this objection is completely overcome in the air-separation process, in which case it becomes a remarkably simple matter to change the degree of fineness of the product, by regulating the velocity of the air current. It is noteworthy that materials of greater specific gravity have been successfully handled by this method. However, the question may not be so much one of gravity as of the size of the particles, for in this industry material as coarse as 20 mesh is marketable. The subject of fineness will be discussed more fully under the heading of tests. Another factor enters into the case when considering a finely screened product. It has been noticed that there is a tendency for the silica and clay to segregate. The clay, being easily reduced, goes through faster than the silica when in a dry state, but the reverse is true when clay is wet. This would naturally follow, as a finer screen having smaller holes would retain more of a substance having the plasticity of this clay. In other words, extremely fine screening alters the uniformity of the mix.

DUST COLLECTION

The most disagreeable as well as harmful factor in making silica cement is the fine dust that floats in the air and settles on everything in and about the plant. It interferes with the operators, and it is a menace to the health of all those coming in contact with it, as its abrasive action on the lungs is self-evident. Physicians are unanimous in stating that this condition will weaken these organs in time, causing a bad form of brickyard consumption. Considering the question solely from the

standpoint of economies, it represents a loss of the finest grained and therefore the most valuable part of the product. In spite of all this, the manufacturers have failed to eliminate the loss, due chiefly to the large investment for an efficient equipment in comparison with the quantity of recoverable material.

The collection of this dust from the points at which it is generated, by means of piping and exhaust fans is a comparatively simple matter, but separation of this collected dust from the air is not so easy. There are two well-known methods utilized in attempting to accomplish this, the cyclone and the bag filter. The former is not effective on minute particles and the latter has a prohibitive installation cost. It is possible that a system similar to the Cottrell electric precipitation method might be used, but again considering the value of the product, the cost would also be prohibitive. Another method proposed is that of using a water spray, but unless water is available in large quantities and means exist to keep it from freezing in cold weather, it would not be practical.

LOADING

The material is loaded either in bags or directly into the car. Bags may be filled from the chute by hand or by machine, as in the case of portland cement. In loading box cars, a portable or hinged conveyor is found to be most practical. The simplest conveyor is a portable type resting on the floor of the car opposite the door and having an extended arm reaching into the end of the car. When one end is filled, the conveyor is reversed to fill the other end, the center of the car being filled by gravity direct from the chute. The hinge conveyor is more convenient, as it is supported entirely outside the car and will deposit material at any point in the car.

TESTS

Mention has been made before of the requirements of silica cement and that specifications differed for different industries. The three most important tests are physical—for example, fineness, fusion and plasticity tests. A sifting through standard mesh screens would show the fineness of the product; commercial averages being about as follows:

Open Hearth		Coke Oven	
	Per Cent		Per Cent
Through 20 mesh.....	100	Through 30 mesh.....	100
Through 30 mesh.....	93	Through 40 mesh.....	96
Through 40 mesh.....	85	Through 60 mesh.....	82
Through 60 mesh.....	70	Through 80 mesh.....	70
Through 80 mesh.....	57	Through 100 mesh.....	55
Through 100 mesh.....	45	Through 200 mesh.....	42
Through 200 mesh.....	28		

In the fusion test the cement must be able to stand up at least to cone 27. Cone 30 is about the limit in refractoriness without sacrificing plasticity.

In the so-called "pail test," an idea of the plasticity is reached in a crude way. This test has been popular, because it actually demonstrates to the practical mind the value of the cement as far as its plasticity is concerned. A certain amount of the cement is mixed with water to make a thin batter as it is actually used. This is allowed to stand a certain length of time and at the end of this time, if the cement has not settled sufficiently to give any resistance to a stick or finger moving through the mixture, it is O. K'd.

It must not be inferred, because the three most important tests are physical, that no chemical tests are important. On the contrary, the alumina and alkali

content are excellent checks on plasticity and fusion tests, and iron oxide on fusion test to a lesser degree. Some steel companies still regard the alumina content as all-important and so make the specifications applicable to this. The loss on ignition serves as a very good control test on the mix. It is easy of manipulation and can be done in a short time. In this test advantage is taken of the fact that silica bats have no loss on ignition and that the clay has a definite amount. Using this as a basis, a set of curves can be made to show direct percentages of clay in the mixture. It is obvious, of course, that in order to obtain accurate results the clay itself be tested constantly for its loss on ignition.

Other tests are not so important, such as crushing tests and hardness tests, but should be made occasionally. A test of practical value consists of trying out the cement between two silica brick and observing its behavior at various temperatures.

Specifications for cement in the coke industry have been made up systematically. The steel industry has not standardized its demand, some plants being interested only in fusion tests, others in the alumina content, still others in fineness, and finally some condemn a cement if it happens to be off color. But in time the specifications will become uniform and co-ordinated to the distinct benefit of the user as well as the producer.

Where Lime Was Used in 1923

The lime sold in the United States in 1923, as recorded by the Geological Survey, amounted to 4,069,830 short tons, valued at \$39,934,707, an increase of 12 per cent in quantity and 20 per cent in value over 1922. Lime sold for construction work increased 15.5 per cent, that sold for chemical use 16 per cent, and that sold for liming land decreased 14 per cent. Hydrated lime, which is included in the total given, increased 10 per cent. The accompanying table shows the sales by uses in 1922 and 1923.

Use	1922		1923	
	Short Tons	Value	Short Tons	Value
Agricultural.....	272,726	\$2,005,082	234,138	\$1,766,574
Building.....	1,845,208	18,463,825	2,131,533	22,521,628
Chemical:				
Glass works.....	62,187	463,628	78,942	676,291
Metallurgy.....	200,799	1,458,553	373,020	3,044,383
Paper mills.....	310,229	2,683,487	311,309	2,768,909
Refractory lime (dead-burned dolomite).....	348,838	2,813,946	357,642	3,599,126
Sugar refineries.....	16,393	197,878	13,044	164,039
Tanneries.....	42,978	420,148	53,906	523,994
Other uses.....	485,441	4,172,420	516,296	4,869,763
Total chemical.....	1,466,865	12,210,060	1,704,159	15,646,505
Sold to dealers (use unknown)...	54,818	576,072	.....	.....
	3,639,617	33,255,039	4,069,830	39,934,707
Hydrated lime (included in totals)	1,106,063	9,868,980	1,219,515	12,170,653

Carbon Black From Gas in 1923

The carbon black produced from natural gas in the United States in 1923 amounted to 138,262,648 lb., an increase of 104 per cent over the production in 1922, according to a statement issued by the U. S. Geological Survey. The increase in the production in 1923 was a result of the expansion of the industry that followed the increase in demand for carbon black by rubber companies in 1922. The number of producers of carbon black reporting to the Survey increased from 26 in 1922 to 47 in 1923, and the number of plants operated increased from 43 to 69. The operations resulted in overproduction late in 1923, as indicated by the large stocks held by producers. The stocks increased from 2,434,547 lb. on Jan. 1, 1923, to 38,320,814 lb. on Dec. 31.

Conquering Natural Brines for Commerce

Report of Investigation of an Ingenious Process, Patented by C. E. Dolbear,
by Which a Complicated Brine May Be Separated Into Its Constituent Salts

By C. T. Bragg and W. P. Putnam

President Bragg Engineering Co., and General Manager Detroit Testing Laboratory, respectively, Detroit, Mich.

AS A result of conferences between the Inyo Chemical Co.'s officers, stationed at Detroit, Mich., and the Better Business Bureau, an organization associated with the Detroit Board of Commerce, the Detroit section of the American Institute of Chemical Engineers was asked, late in March, 1924, by the Better Business Bureau to review in a general way the claims of the Dolbear process. The Inyo Chemical Co., controlling the rights to the Dolbear process, agreed to demonstrate the process to the members of the Detroit section.

C. E. Dolbear of Pasadena, Calif., to whom several patents had been issued, came to Detroit about the middle of April, carried through before the authors and others the separation of a sample of the brine, taken from Searles Lake. Separations were carried out easily and quickly. No attempt was made by any of those present to check the proportions to the whole of the various salts produced, nor was any attempt made to ascertain their purity or the completeness of the separation.

At the next regular meeting of the local section, held the evening of May 2, Mr. Dolbear described the process in detail and answered questions pertaining thereto. There were present eight members of the local section, including the authors, A. B. Connor and Professors A. H. White, W. L. Badger and E. M. Bacon, of the University of Michigan, R. A. Plumb and N. C. Ortved. Among the guests present were Dr. J. C. Olsen, of the Brooklyn Polytechnic Institute, and Professor Withrow, of the Ohio State University. The Better Business Bureau and the Inyo Chemical Co. were both informed after the meeting that the section believed the process, as explained, to have merit and believed that it warranted fuller investigation. The authors were retained about the middle of May to make a thorough investigation of the process itself, and are able to present a report of the progress so far made.

The samples of solar salts worked upon by the authors were from Searles Lake and were reported to have the following composition:

	Per Cent		Per Cent
Na ₂ SO ₄	18.8	KCl	13.0
Na ₂ B ₄ O ₇	8.2	NaCl	45.0
Na ₂ CO ₃	15.0		

Our own analysis of the actual samples was as follows:

	Per Cent		Per Cent
Na ₂ SO ₄	18.02	R ₂ O ₃ .....	.07
Na ₂ B ₄ O ₇	8.79	KCl	13.35
Na ₂ CO ₃	14.20	NaCl	43.08
Ins. residue .....	.16	Moisture	1.33

Paper presented at the Denver meeting, American Institute of Chemical Engineers, July, 1924. Patent referred to issued to C. E. Dolbear, June 3, 1924, Nos. 1,496,152 and 1,496,257.

The composition of Owens Lake solar salts is very similar to that of Searles Lake.

The process as extracted from a description by Dolbear is essentially as follows:

First, by solar evaporation, eliminate the water of the brine until a practically dry mixture of the salts is obtained. A given weight of the raw salts is mixed with a solution, saturated when cold, with all of these salts, and the mixture is heated with agitation. The quantity of solution must be large enough to dissolve the potassium chloride and borax in the raw salts. This effects a separation, as the other salts, being no more soluble in a hot solution than when cold, remain undissolved.

The hot solution is then separated from the undissolved salts by spinning in a centrifugal machine. The hot brine is allowed to cool in a practically quiescent condition. Potassium chloride alone crystallizes from the brine under these conditions. If the cooled brine is then agitated, the borax crystallizes out immediately therefrom, effecting an unusually complete separation.

If the brine is cooled to the same temperature that it was initially, the brine must of necessity deposit exactly the same amount of these two salts that it took up from the raw salts. Of course, it is not mechanically possible to separate the brine completely from the deposited potassium chloride, hence a little borax and other salts will contaminate the deposited potassium chloride. It has been found that by reheating the potassium chloride with the adhering mother liquor, spinning the hot, wet salt in a centrifugal machine, and washing the spinning salts with a spray of wet steam, the content of borax and other salts can be brought down to almost nil. Actually it is easy to eliminate the borax down to less than 0.1 per cent.

The borax in crystallizing combines with ten molecules of water, and to that extent dehydrates the solution. This causes a certain amount of potassium chloride and other salts to crystallize with the borax. It can be effectively prevented, however, by adding just the amount of water to the solution that the borax takes up. Following are analyses of potassium chloride and borax made in a pilot plant by this process:

Potassium Chloride		Borax	
	Per Cent		Per Cent
KCl	99.81	Na ₂ B ₄ O ₇	53.02
Na ₂ CO ₃	0.13	CO ₂	0.00
Na ₂ B ₄ O ₇	0.05	SO ₂	0.00
SO ₂	Tr.	Cl	Tr.
	99.99	K	Tr.
		H ₂ O	46.98
			100.00

After the potassium chloride and borax have been separated from the brine, the brine has exactly the same composition that it had originally, and is used again

to recover more potassium chloride and borax. This cycle is repeated over and over.

RECOVERY IS EXCELLENT

The recovery of potassium chloride, carefully measured and averaged for three continuous runs, was 95.3 per cent of the theoretical. The loss was evidently accounted for by incomplete separation of the leaching brine from the leached salts, for their analysis showed 0.72 per cent KCl. This is equivalent to 0.6 per cent on the original weight of the raw salts, and as the raw salts carried 12.7 per cent KCl and lost approximately 20 per cent of their weight in leaching, we have 12.7 minus 0.6 equals 12.1 and 12.1 divided by 12.7 equals 95.2+ per cent. The potassium chloride lost in this manner is finally recovered, as will appear below.

The leached salts, composed chiefly of sodium chloride, sodium sulphate and sodium carbonate, with a very small amount of potassium chloride and borax, are leached with a solution of sodium chloride in just a sufficient degree of saturation so that all the sodium carbonate and sodium sulphate will be dissolved without dissolving any sodium chloride.

This solution, of course, dissolves also the small amount of potassium chloride and borax present. The solution is separated from the undissolved sodium chloride by spinning in the centrifugal machine. By very slight washing the sodium chloride remaining in the machine is rendered extremely pure.

The brine is then subjected to the action of carbon dioxide, whereby the sodium carbonate is converted to sodium bicarbonate, and this latter, being insoluble in the brine, precipitates out and is separated from the brine in a centrifugal machine. It is then calcined to soda ash.

The remaining brine, containing sodium chloride and sodium sulphate, is treated with ammonia gas. When it has absorbed 24 per cent ammonia all of the sodium sulphate has been precipitated in anhydrous condition. This is separated from the brine in a closed centrifugal machine.

The ammoniacal sodium chloride solution is then heated in an ammonia still and the ammonia distilled over to cause precipitation of another batch of sodium sulphate. After the ammonia has all passed over, the brine is drained from the still and cooled, and is ready to be used to dissolve more sodium carbonate and sulphate from more of the first leached salts.

In this manner the whole process is cyclic in character, nothing being thrown away, so that only loss of any salt can be by one salt being present in another salt as an impurity. The wash waters are of small volume and go to make up for evaporation and water of crystallization losses.

The sodium chloride, sulphate and carbonate leaching with the sodium chloride solution takes up the potassium chloride and borax losses of the first leaching, as above stated. These latter salts will slowly accumulate in sufficient percentage to be worth while. Then the brine can be evaporated away in the ammonia still until it becomes saturated while hot with potassium chloride and borax, and if this hot brine is allowed to cool, the potassium chloride and borax can be crystallized out and recovered as in the first operation above described. The mother liquor therefrom can then be added to the mother liquor of the first operation. In this case the new leaching solution of sodium chloride

must be made up to use for the leaching of the sodium chloride, sodium sulphate and sodium carbonate salts.

The process as described is covered in its essentials by patents issued to C. E. Dolbear June 3, 1924, Nos. 1,496,152 and 1,496,257.

Borax produced by this process as analyzed by the authors gives the following analysis:

	Per Cent		Per Cent
Cl ₂	0.21	Borax	96.45
SO ₃	Tr.	Moisture	3.34
CO ₂	Tr.		
Ins. residue	Tr.		100.00

This checks very closely as claimed by Dolbear. An examination of potassium chloride produced gives the following:

	Per Cent		Per Cent
Borax (Na ₂ B ₄ O ₇) ..	0.36	Na ₂ CO ₃ .....	.21
R ₂ O ₃ .....	.13	KCl	99.105
Ins. residue .....	.03		
Na ₂ SO ₄ .....	.085		100.00

Nine complete separations of the solar salts were made by the authors in the Detroit Testing Laboratory, following closely the rules laid down by the process as described. Qualitatively there is no difficulty whatever in separating potassium chloride, borax, sodium sulphate, sodium carbonate and salt. From the quantitative viewpoint, a real interest centered on the separation of potassium chloride and borax, as obviously the value of the process lies principally in its ability to produce KCl and borax of a high degree of purity. The amount of solar salts available for use was comparatively small, so that the separations were carried out on the laboratory scale. Each one of the precipitates of KCl contained a little less borax than the one preceding, so that the ninth separation was very much better than the first, showing KCl of 99.70 purity.

It is evident to us that the purity of the KCl will depend very much on the completeness of washing after filtration. It is safe to predict that both the KCl and borax can be separated in a high degree of purity as claimed. Work on the process will be continued by the authors, using a much larger quantity of the solar salts, making the filtrations with the centrifuge so arranged that a better degree of washing of the KCl can be carried out.

Saturation Relations in Sugar Mixtures

The sugars, sucrose, dextrose and levulose that constitute our adult sugar diet occur in commerce as solids and saturated or nearly saturated sirups. The solubilities of each in the presence of the others have been recently determined, the results of this study, by Richard F. Jackson and Clara G. Silsbee, of the Bureau of Standards, are given in Technologic Paper 259. It is found that invert sugar or dextrose diminishes the solubility of sucrose in water, but that the total sugar content is greatly increased. Similarly, sucrose and levulose diminish the solubility of dextrose. The measurement of the influence of levulose on the solubility of dextrose has made possible a computation of the composition of invert sugar solutions that are saturated with dextrose. This has been designated the "solubility of invert sugar." The compositions of mixtures of sucrose and invert sugar that are saturated with both sucrose and dextrose at various temperatures have been determined. Such solutions possess the maximum solubilities that may be reached by partly inverted sucrose solutions.

Equipment News

From Maker and User

Spray Drying

Where spray drying has been successfully applied, the results obtained have been so satisfactory that there should be much interest in any new spray drier for which wider application is claimed. Such an apparatus is the new drier made by the Chemical Construction Co., Charlotte, N. C., according to the patented Krause process, a German development.

Referring to the accompanying cut, the operation of this drier is as follows: In the drying chamber there is a metal spray disk, driven by a steam turbine or high-speed electric motor, which revolves at an exceedingly high rate of from 5,000 to 24,000 r.p.m. The rate of revolution depends upon the size of the disk and the materials to be handled. The liquid flows in a constant stream to the center of the spray disk from a feed tank located above the drying chamber or from pumps located below. The centrifugal force developed by the rotating disk causes the liquid to be

great rapidity from the periphery of the disk. A stratum of extremely fine mist, composed of small particles of the liquid, is thus formed around the metal disk, extending to the inner circumference of the drying chamber.

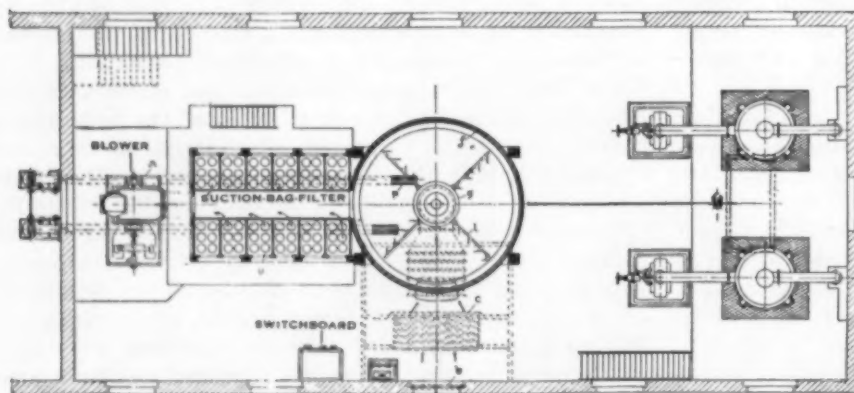
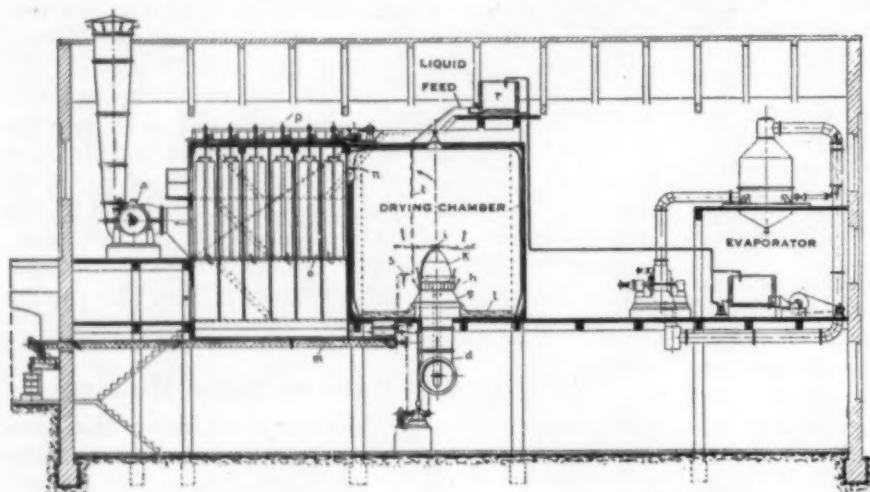
In order to evaporate the water from this mist, a current of heated air is introduced into the chamber in such a way as to remove the moisture almost instantaneously and at a low temperature. Part of the dried particles fall to the floor of the chamber, from which they are removed by scrapers; the remaining dried particles are carried upward by the current of air and separated from the air by filtration. Both these classes of particles are obtained in the form of a dust-fine powder containing an average of from 1 to 5 per cent of water, which means that they have been thoroughly dried and at the same time all essential properties of the material are claimed to be retained.

The cut shows a milk-drying installation at Lodi, Italy, that has a capacity for drying 1,250 gal. of whole milk per hour. The air required for drying is

drawn through the whole system by a suction fan *a*, enters by means of the fresh air filter *b* first into the heater *c*, in which the necessary heating of the air is accomplished. The warm air then passes through pipe *d* into the tower *g* in the drying chamber *f*. It is then conducted by means of special apparatus *h* in a suitable manner into the drying chamber.

Above the dome-shaped vault of the tower *g* the horizontal disk revolves, being driven by the steam turbine *k*. That part of the dried material that settles to the floor is removed by the scraper *l* into a discharge hopper *p* and is carried away by conveyor *m*. That part carried by the air stream passes off through the opening *n* and is removed in the filter *o*. The same conveyor *m*, mentioned above, carries the material away from this filter. The substance to be dried flows from the container *r*, placed above the drying chamber, through a regulating valve *s* and pipe *t* onto the spraying disk.

This method of drying is claimed to be economical both of heat and labor. It is also claimed to give a more perfect product than other driers. It is recommended for milk, casein, meat juice, eggs, gelatine, urea, ammonia salts, soap powder, latex, dyes, fruit juices, tanning compounds, oil refinery lyes, other lyes, yeast, malt extract, magnesium chloride, cerium chloride and other similar materials.



Typical Installation of Krause Process for Spray Drying

Portable Flight Conveyor

The recently increased demand for conveying equipment, incident on the growing shortage of common labor, has resulted in the appearance of many new devices in this field. One of the most recent to attract notice is the portable flight conveyor made by the Gifford-Wood Co., Hudson, N. Y.

This machine is designed for handling loose material having a large percentage of lumps. It is 24 ft. in length and has a width of trough of 20 in. The weight is 2,580 lb. Large diameter wheels with wide recessed tread are provided to enable the machine to be easily moved over rough ground. The capacity is 1 ton or more per minute, depending on the material, when continuously fed. Two men are required to operate it, as against seven men to replace it by hand labor.

The frame consists of two side channels, bolted to a flat plate, thus forming the trough. In this trough run two malleable griplock chains separated by heavy steel flights of channel section. The supporting frame and carriage is of pipe and angle construction. Power is provided from a 3-hp. electric motor or a 5-hp. gasoline motor, as desired.

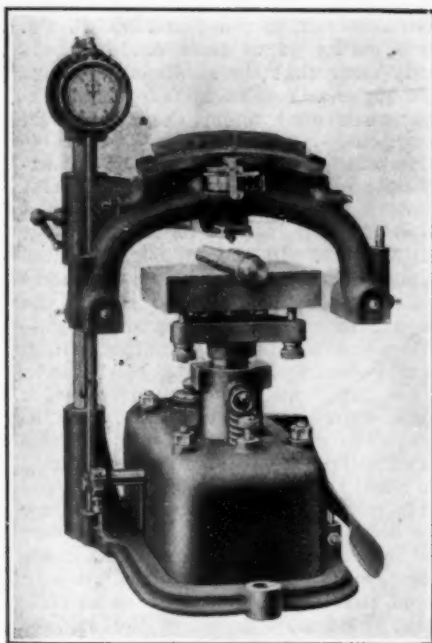


Fig. 1—Operating Stand for Pendulum Hardness Tester

Devices for Hardness Testing

In *Chem. & Met.* for June 25, 1923, there was published an illustrated article describing the pendulum hardness tester made by Edward G. Herbert, Ltd., Manchester, England. Since that time this manufacturer has improved the device, and these improvements have been shown for the first time at the current Machine Tool Trades Exhibition in London this month.

The first of these improvements is the pendulum operating stand, shown in Fig. 1. This device is designed for inspection testing where a large number of tests must be effected rapidly. It also permits "time" tests to be made without previous practice. With this stand the standard Pendulum Hardness Tester is used and the operation is entirely mechanical. Slight movements of one handle serve to release the table and allow it to rise until the pendulum swings on the work; to operate the stop watch; and to lower the table and replace the pendulum on its support when the test is completed. This stand will accommodate specimens up to 6 in. in diameter or depth. The stand regularly comes with a table for round or rectangular pieces; but special fixtures

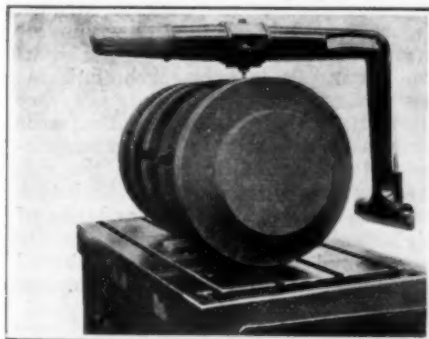
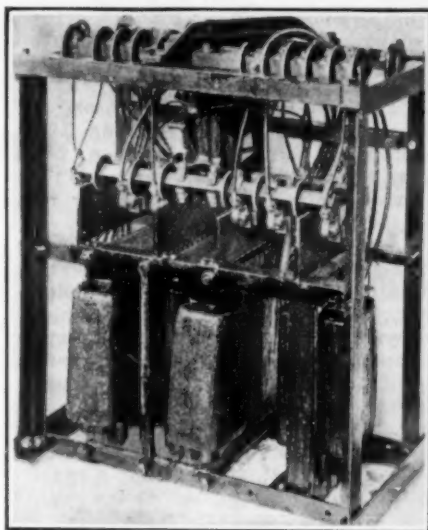


Fig. 2—24-Kilogram Pendulum Hardness Tester for Large Work

for testing irregular work can be supplied.

Fig. 2 shows the new 24-kilogram Pendulum Hardness Tester. This device is identical in principle with the 4-kilogram tester described in the article mentioned above, but is adapted for testing larger work. With it, hardness tests can be made on shafts or rolls up to 30 in. in diameter, at any point on flat surfaces 30 in. wide, at any point on the face of gears or drums of any diameter and up to 30-in. face, and inside a hole such as the bore of a gun or a large bearing. The pendulum weighs 24 kg. and is pivoted on a steel ball 3 mm. in diameter. Adjustable weights are provided whereby the center of gravity of the pendulum can be brought to the center of the ball, and a central weight mounted on a microm-



Inside View of Compensator

eter screw provides for adjusting the weight of the pendulum. This device is adapted for making time tests for indentation-hardness, scale tests for work-hardness, and for measuring the work-hardening capacity of metal.

Starting Motors

An automatic high-voltage compensator for starting electric motors has just been placed on the market by the Electric Controller & Manufacturing Co., of Cleveland, Ohio. This compensator is built for voltages 2,500 and below. It is push-button operated and entirely automatic. With the exception of the overload panel, which is mounted on the top of the tank, it is entirely submerged in oil and the tank is so designed that it is dustproof, weather-proof, vapor-proof and fire-proof. It can be installed either indoors or outdoors.

A push button is operated by an independent low-voltage circuit, which is taken from an independent transformer so that there is no danger of the operator ever coming into contact with the high-voltage circuit. Having the starting transformers and the operating mechanism entirely submerged in oil automatically operated removes all possibility of explosions or high-voltage flashes.



Outside View of Compensator

This automatic compensator is so designed that continuous torque is applied to the motor from the time the push button is pressed until the motor has been brought up to speed. Operating the start switch causes the motor to be started under reduced voltage obtained from the transformers in the compensator, and after the motor has reached the proper and safe speed it is automatically thrown across the line by the compensator. It is claimed by the makers of this device that a great many more high-voltage motors will be used now that a safe high-voltage starting compensator has been placed on the market.

Manufacturers' Latest Publications

Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill.—Book 670. A new catalog describing the various types of Link-Belt locomotives, cranes and their application in industry.

Union Iron Works, Erie, Pa.—A booklet describing the "Universal" boiler, a boiler made in sizes from 25 to 150 hp. for installations where only small floor space is available.

American Blower Co., Detroit, Mich.—Bulletin 1101. A new leaflet on applications of "Sirocco" type fans. Bulletin 1813. A leaflet showing a method for installing the "Ventura" ventilating fan in the outside wall of a frame building.

General Refractories Co., 117 South 16th St., Philadelphia—A new general catalog of the products of this company with many helpful tables and data of value to the engineer.

The Duriron Co., Dayton, O.—Bulletin 116-C. A general description of the characteristics and uses of Duriron.

Pryko, Inc., 39 Cortlandt St., New York, N. Y.—Bulletin 7244. A bulletin on the "Wansteel" steam trap, a device marketed by this concern.

Automatic Molding Press Co., 280 Passaic St., Newark, N. J.—A folder on the Duo-Press, a universal automatic molding machine for plastic materials.

Commercial Testing & Engineering Co., Old Colony Building, Chicago, Ill.—A booklet describing methods of gathering and preparing coal samples for analyses.

The Edward Valve & Mfg. Co., East Chicago, Ill.—Bulletin 8A. A booklet describing valves for 400 lb. working steam pressure.

Readers' Views and Comments

An Open Forum

The editors invite discussion of articles and editorials or other topics of interest

Phosphorus Halide Corrosion

To the Editor of Chem. & Met.:

Sir—Your recent number devoted to the problems on corrosion reminded me of some information I possess which may be of some value to someone, and I therefore pass it on to you as the best central source. Phosphorus pentachloride, both at room temperature and up to 200 deg. C., does not affect nickel and it has only a slight effect on Monel metal. The reagent attacks every other metal tested to a greater or lesser extent. Nickel and Monel metal are also resistant to organic acyl chlorides and to the other halides of phosphorus, although in this they are not alone, as in the case of the pentachloride. MENAHEM MERLUB-SOBEI.

Cartaret, N. J.

Crude Sulphur in Fruit Preservation

To the Editor of Chem. & Met.:

Sir—The article on "Production and Use of Refined Sulphur," by Charles A. Newhall, in the July 28 issue of *Chem. & Met.* contains reference to an alleged superiority of sublimed sulphur over crude sulphur in the preservation of fruit. The conclusions are at variance with the results of investigations carried out by me last year at the University of California farm at Davis; and in the interests of accuracy and scientific impartiality I am prompted to submit details to refute Mr. Newhall's contentions.

The function of the burning sulphur is to create a saturated atmosphere of sulphur dioxide, from which the moist fruit absorbs sufficient of the gas to act as a preservative during drying and subsequent storage. Providing the sulphur be free from volatile injurious impurities, the problem is merely one of insuring steady and complete combustion. The crude material contains a small percentage of petroleum, which tends to form a floating film on the burning sulphur and to extinguish it. In order to concentrate sufficient heat to volatilize or carbonize this oil film and to permit the complete combustion of the sulphur, the Texas Gulf Sulphur Co. has devised a set of superimposed shallow pans, which are filled with sulphur and stacked alternately in such a manner as to leave free openings at the corner of each. Complete combustion is further facilitated by sprinkling a small amount of charcoal on the surface of the sulphur.

In each test two trays of uniformly ripened fruit—halved, pitted and sprinkled with water—were prepared. Each was placed in a separate sulphur house, in one of which crude sulphur was burned; in the other, sublimed sulphur. The same amount of sulphur was used in each house, and the rate of burning was regulated as nearly as possible to give the same rate of

combustion. A set of four pans was used for the crude sulphur; the sublimed sulphur was burned in a single bucket. Eight pounds was used in each instance. The time of exposure was from 5 to 6 hours. After sulphuring, the fruit was dried in the usual manner.

In the first test, on Royal apricots, the crude sulphur product had a slightly less even color, which tended more to a yellowish orange, in contrast to the uniform pinkish orange color of the sublimed sulphur product. However, both lots were commercially satisfactory in color, and the slight difference would not be noticeable without the benefit of a direct comparison. In the second and third tests, on Muir peaches, no difference between fruit treated with crude sulphur and that treated with sublimed sulphur was noticeable.

The efficiency of the sulphuring process is dependent within certain limits on the concentration of sulphurous acid produced in the fruit. Analyses were therefore made to determine the amount of SO₂ remaining after sulphuring and drying, with the following results:

	Kind of Sulphur	SO ₂ , Parts Per Million
Apricots	.....Sublimed	3,757
"	.....Crude	3,475
Peaches	.....Sublimed	1,811
"	.....Crude	1,267
"	.....Sublimed	1,818
"	.....Crude	1,702

In every instance the amount of sulphur dioxide absorbed from crude sulphur is less, but the difference is not sufficient to affect materially the color or keeping qualities of the fruit. Peaches and apricots can be satisfactorily sulphured with crude sulphur if proper equipment be used to secure steady and complete combustion. The use of the crude material in large driers or packing houses should result in a material saving in expenditures for sulphur.

The above comments have been embodied in the form of a report submitted to the Texas Gulf Sulphur Co., supplying the crude sulphur used in the tests.

ARTHUR W. CHRISTIE.

Berkeley, Calif.

To the Editor of Chem. & Met.:

Sir—I am sorry that Professor Christie has written the above letter in a controversial vein "to refute contentions" attributed to my paper on "Refined Sulphurs, Their Manufacture and Uses." In my paper I tried to be most careful to avoid controversy and hold closely to established matters in the discussion of the properties and uses of the various sulphurs. The results of Professor Christie's tests were not available at the time the text of my paper was prepared. Had these tests been published at the time, I should

have referred to them and so worded my remarks as to have made it perfectly clear that the sublimed sulphurs give superior results in fruit preservation when used under the usual field conditions.

My conclusions were based on the experience of hundreds of practical fruit growers and a knowledge of the fruit sulphuring industry extending over many years. In the industries where sulphur fume is used as a preservative the endeavor always is to reduce the amount of sulphur to the lowest possible point consistent with the desired results—namely, thorough sterilization of the raw fruit, the development of a bright uniform color, and finally the injection of enough of the sulphurous preservative agent so that the dried fruit will remain sterile under the usual trade conditions. Common procedure has been to use, say, 6 lb. of sulphur and leave the fruit in the sulphur house 3 or 4 hours. More recently it has been found that the use of 3 lb. of sulphur with 10 or more hours in the sulphur house will give good results and at the same time give a dried fruit with about half the sulphur content; the use of less sulphur with longer exposure reducing the sulphur dioxide content of the fruit from about 3,000 to about 1,000 parts per million.

Crude sulphur cannot be burned safely in the usual sulphur house equipment for the reason that one can never tell when the flame will go out. Working so very "close to the line" as is the common practice, one can readily see that it is essential that no chances be taken in an unexpected reduction of the amount of sulphur burned. This is the reason that the practical grower prefers to use sublimed sulphur, which may always be depended on to burn uniformly and completely without any artificial aids. The use of charcoal and the superimposed pans as developed by the Texas Gulf Sulphur Co. and used by Professor Christie in his tests is certainly a neat and clever idea to get around this admitted difficulty in the combustion of the crude sulphur from the Gulf coastal fields. However, it is very doubtful whether the practical grower will wish to risk his whole season's work for the few cents difference in price between the crude sulphur burned in the pans and the sublimed sulphur burned in his usual equipment.

Furthermore it should be borne in mind that it is by no means certain that the sole function of the burning sulphur is to produce a saturated atmosphere of sulphur dioxide gas, as Professor Christie appears to assume. We used to hold that sulphur dioxide was the sole sterilizing and preservative agent. Recent research indicates that other sulphur compounds are very powerful lethal agents. Professor Christie's own analyses show a surprising and uniform difference in the sulphur content of the fruits treated with the same amounts of the two kinds of sulphur, a difference that would hardly be expected if both sulphurs behaved the same and burned entirely to sulphur dioxide.

Professor Christie's tests are very interesting and indicate what I tried to convey throughout my paper—namely, the great need of a thorough study of

all the forms of sulphur as applied in the industries and arts. This single series of tests does not, to my way of thinking, justify any change of conclusions and certainly does not warrant the fruit grower in risking a year's work by switching to the use of crude sulphur.

CHARLES A. NEWHALL.
Seattle, Wash.

Emergency Use of Acetylene Cutting Equipment

To the Editor of Chem. & Met.:

Sir—In the Aug. 25 issue of *Chem. & Met.* you advocate the inclusion of acetylene cutting equipment as a part of the emergency equipment of industrial plants as well as railroad trains. The plant offers possibility for the maintenance of skilled operators at points away from the hazardous operations and for storage of the equipment under conditions that will not involve

it in any accident. But where on a train is the oxy-acetylene equipment to be kept with an assurance that it will be in a usable condition after a catastrophe, and where are the skilled operators to be stationed?

The manipulation of a sledge or an ax is within the scope of most of the passengers or crew. But very few of these have the technique necessary for the successful operation of an acetylene torch. In the hands of a novice such device may prove more of a danger than an aid. The quantity of gases that can be carried on a train is necessarily limited and must be used with the utmost efficiency to accomplish the greatest benefit. Only in the hands of an experienced operator would this be possible. The problem of supplying this skilled service at the necessary time and place is a considerable one.

A. E. MAZE.

East Orange, N. J.

suggestions regarding the control of the process apply equally well, however, when the newer equipment is used.

THE CONCENTRATION OF SULPHURIC ACID. by John Wilfrid Parkes, Technical Superintendent, W. & H. M. Goulding, Ltd. 294 pages. D. Van Nostrand & Co., New York. Price, \$9.60.

This is Volume III of the revised edition of Lunge's "Manufacture of Acids and Alkalis." Taking advantage of the opportunity of devoting an entire volume to the subject, the author has retained a short description of some of the earlier plants, but the greatest proportion of the text is devoted to entirely new matter. Not only are there descriptions of all the newer and more economical types of plants that have been evolved by practical experience during the past decade, but the theoretical principles underlying the various processes are treated in greater detail than formerly.

The concentration of sulphuric acid was one of the earliest problems the chemical engineer was called upon to solve during the World War, and the necessity for dealing with huge quantities of weak acids produced in the manufacture of explosives directed attention toward the development of units of large capacity, especially in the government factories. No fundamentally new types of plants were evolved, but progress followed along well-defined lines. Much valuable experience and data have been obtained, however, from these plants, which are described in the text.

Books Recently Received

Practical Mathematics

PRACTICAL CALCULUS FOR HOME STUDY. By Claude Irwin Palmer, Associate Professor of Mathematics, Armour Institute of Technology. 443 pages. Illustrated. McGraw-Hill Book Co., New York. Price, \$3.

Many men without college training have need for working knowledge of the calculus and its practical applications, but there has been no book available to give them the essentials of the subject without the assistance of an instructor. This book aims to meet that need. It aims to give the man with limited mathematical training the ability to make use of the calculus as he needs it in his work. To this end the explanations are detailed and complete. An important feature of the book is the fact that it brings out as early as possible the many helpful uses of the calculus. While the emphasis in this treatment is upon the practical application of its principles, and while the explanations are as non-technical as possible, the accuracy of the mathematical methods has not been sacrificed.

PRACTICAL MATHEMATICAL ANALYSIS. By H. von Sanden, Professor of Mathematics, University of Clausthal, with examples by the translator, H. Levy, Professor of Mathematics, Imperial College of Science and Technology, London. 195 pages, illustrated. E. P. Dutton & Co., New York. Price, \$4.50.

This work is based on the courses in numerical and practical calculations conducted at the University of Göttingen by Prof. C. Runge, who has done valuable pioneer work in bridging the gap between the elegant solutions of pure mathematicians and the practical numerical solutions required by engineers and technical men. Von Sanden's work, thoroughly adapted to the needs of American readers by the translator, exemplifies Runge's methods in the clearest and most practical form, and occupies a unique position in the

field of applied mathematics. The scope of the book is defined by the author as covering "that section of mathematics which embodies what Felix Klein on one occasion termed 'the executive element in mathematics.' All the methods discussed are developed with the principal object of devising means whereby the desired results may be expressed ultimately in numerical form." The treatment covers the slide rule and calculating machine; rational integral functions; analytical approximation to empirical functions; solution of equations; graphical and numerical integration of ordinary differential equations of the first, second and higher orders.

Organic Electrochemistry

A BIBLIOGRAPHY OF ELECTRO-ORGANIC CHEMISTRY. By Maz Knobel. Issued in mimeograph form by National Research Council, Washington, D. C. Price, \$1.

There are 431 references showing the application of electrochemistry to the preparation of organic compounds.

Sulphuric Acid

THE MANUFACTURE OF SULPHURIC ACID: CHAMBER PROCESS. By Wilfrid Wyld. 424 pages. Illustrated. D. Van Nostrand Co., New York. Price, \$9.

This is Volume II of the revised edition of Lunge's "Manufacture of Acids and Alkalis." As the new volume treats only the chamber process, it has been possible to include much new matter and discuss more adequately modern developments in chamber practice. Although there have been a large number of patents taken out on apparatus designed to replace the large, costly chambers, there are still very little reliable data on the newer systems of acid production. The instructions or

Book Review

Cellulose Chemistry

TEXTBOOK OF CELLULOSE CHEMISTRY: For Students in Technical Schools and Universities as well as for Cellulose Experts. By Emil Heuser, translated from the second German edition by Clarence T. West and Gustavus J. Esselen, Jr. 203 pages. McGraw-Hill Book Co., New York. Price, \$2.50.

Hardly any branch of chemistry of definite industrial significance has been so poorly developed as that of cellulose and the closely related compounds with which it occurs in nature. Because of this, many industries such as the paper and pulp, explosives, cellu-silk and pyroxylin have been forced to grope along very much in the dark as to the exact nature of the substance of their raw materials and of the reactions taking place in processes of manufacture. One can but wonder to what extent these industries might have developed today if the mysteries of the cellulose molecule had been thoroughly explored and explained 30 years ago!

At present keen interest centers around cellulose, lignin, pectin and their derivatives. Many plant chemists, though weary of being befuddled by such hazily understood and defined terms as hydrocellulose, hydracellulose, oxycellulose, alpha, beta and gamma cellulose, are still eager for light. It appears that just as at cer-

tain periods in the past the uric acid group, the carbohydrates and the proteins have centered the interest of investigators, so at present cellulose is very nearly succeeding in holding the stage.

For this reason an able translation of Heuser's excellent book comes at an opportune time. No book can in itself clarify completely the questions relating to cellulose, but this particular one certainly tends to do away with the hazy conceptions and apparently conflicting evidence that have existed in the past. It is highly worth while in that it succeeds in linking much scattered information that requires correlation to make it valuable. Heuser can well be commended for his fair-minded treatment of the facts that he mentions—resulting from the work of no less than 240 investigators. It is true that he has used every means to justify his contention that cellulose may be considered as very similar to an aliphatic alcohol, but there can be no doubt that his position is well taken.

To this end he divides the main part of his book into four parts. In one of these he compares the alcoholates of cellulose to those formed by simple alcohols that are well known. In another he shows that cellulose ethers bear a marked resemblance to those formed by such a compound as ethyl alcohol. In the same way esters of cellulose are discussed in relation to the simplest aliphatic compounds known, as in the case of ethyl nitrate compared with cellulose nitrate. Following his scheme further, Heuser accounts for oxycellulose on the theory that it is an aldehyde alcohol—rarely homogeneous—and he cites the end products of cellulose oxidation as partial evidence. He scoffs hydrocellulose as differentiated from simple cellulose, believing it merely a swollen form of the latter.

Further chapters deal with the degradation and the constitution of cellulose. The fact is pointed out that the same end products are obtained in the hydrolysis of cellulose as in the case of starch. Whether degradation is by sulpholysis, acetolysis or fermentation, the steps involved include the formation of cellobiose, that in turn is converted to glucose. Facts of this sort may prove, in the case of cellulose as they did in the case of protein, to be the key to successful synthesis. When such a time comes the chemistry of cellulose can be disposed of in a few words.

In the meantime much argument will continue on the constitution of this compound. Heuser considers this at length and compares the formulas of Cross and Bevan, Tollens, Green, Ost, Pictet and Sarasin. We agree with the translators that Hibbert's work has been slighted and are glad to find their note correcting the omission. But after reading the chapter we still wonder what the ultimate answer will be. Heuser himself does not feel discouraged, however, saying in relation to successful synthesis: "This is a dark, unexplored field. Yet this is not to be regretted; rather should we rejoice that this is a goal to the attainment of which the younger generation is called."

HAROLD J. PAYNE.

U. S. Patents Issued September 9, 1924

Method of Manufacturing White Sulphite Cellulose From Resinous Woods. Harry Alfthan, Mantta, Finland, assignor to G. A. Serlachius Aktiebolaget, Mantta, Finland.—1,507,559.

Process and Apparatus for Synthesizing Ammonia. Edwin H. Arnold, Coventry, and William T. Wakeford, Providence, R. I., assignors to the Nitrogen Corp., Providence, R. I.—1,507,560.

Method and Apparatus for Manufacturing Tire Casings. Adrian O. Abbott, Jr., Detroit, Mich., assignor to Morgan & Wright, Detroit, Mich.—1,507,563.

Process for the Preparation of Saccharin. Jean Altwegg and Jean Collardeau, Lyon, France, assignors to Société Chimique des Usines du Rhône (Anciennement Gilliard P. Monnet et Cartier), Paris, France.—1,507,565.

Method of Producing Hard Rubber. William C. Geer, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.—1,507,594.

Method and Apparatus for Treating Rags in the Production of Paper Stock. J. H. Howe and Charles E. Stevens, Fulton, N. Y., assignors to Arrowhead Mills Inc., Fulton, N. Y.—1,507,605.

Shower Pipe for Paper-Making and Similar Machines. Henderson Kidd, Chester, Pa., assignor, by mesne assignments, to Scott Paper Co.—1,507,608.

Rotary Pump. Fred A. Leigh, Detroit, Mich.—1,507,611.

Grinding Machine. Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass.—1,507,629.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers. They will be studied later by "Chem. & Met." staff, and those which, in our judgment, are most worthy, will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Process of Making Gasoline. Harold E. Thompson, Clendenia, W. Va., assignor to Carbide & Carbon Chemicals Corp.—1,507,634.

Insecticide. James A. Ullman, White Plains, N. Y.—1,507,637.

Apparatus for Distillation of Mineral Oils. Elmer E. Billow, Evanston, Ill., assignor of one-half to Adolphus M. Allen, Chicago, Ill.—1,507,659.

Agglomerated Finely Divided Material and Process of Producing the Same. Theodore Nagel, New York, N. Y.—1,507,673.

Process of Briquetting Finely Divided Materials. Theodore Nagel, New York, N. Y.—1,507,674.

Binding Fuel Material. Theodore Nagel, New York, N. Y.—1,507,675.

Binding-Fuel Material for Briquetting Finely Divided Materials and Process of Producing the Same. Theodore Nagel, New York, N. Y.—1,507,676.

Binding-Fuel Material and Method of Producing Same. Theodore Nagel, Brooklyn, N. Y.—1,507,677.

Binding-Fuel Material and Process of Producing the Same. Theodore Nagel, Brooklyn, N. Y.—1,507,678.

Fuel. Theodore Nagel, Brooklyn, N. Y.—1,507,679.

Method and Apparatus for Vulcanizing Rubber Articles. Ralph R. Root, Lakewood, O.—1,507,686.

Method and Apparatus for Electrical Precipitation of Suspended Particles From Gases. Walter A. Schmidt, Los Angeles, Calif.—1,507,687.

Process of Making Calcium Arsenate in Dry Powdered Form. Willis H. Simpson, East Orange, N. J.—1,507,690.

Process of Purifying Light Petroleum Oils. Francis H. Smith, El Segundo, and George J. Ziser, Los Angeles, Calif., assignors to Standard Oil Co., San Francisco, Calif.—1,507,692.

Manufacture of Arseno Compound of the Pyrazolone Series. Karl Streitwolf, Höchst-on-the-Main, Germany, assignor to Hermann A. Metz, New York, N. Y.—1,507,694.

Apparatus for Treatment of Liquids. William S. Elliott, Pittsburgh, Pa.—1,507,699.

Liquid-Measuring Apparatus. George W. Mackenzie, Beaver, Pa.—1,507,705.

Process of Producing Aluminum Chloride and Sodium Silicate. Samuel Peacock, Wheeling, W. Va., assignor to Willis G. Waldo, Washington, D. C.—1,507,709.

Dehydrator. Rush J. Ritchie, Kansas City, Mo., assignor of one-half to Frank Spiekerman, Greenwich, Conn.—1,507,719.

Machine or Apparatus for Dyeing and the Like. Joe Kershaw, Menston, England.—1,507,779.

Carbonizing Compound and Process of Making and Using It. Stanley B. Mathewson and Walter K. Jamison, Springfield, O., assignors to Walter K. Jamison, Stanley B. Mathewson and Mrs. S. B. Mathewson, trustees of the Lecar Carbon Co., a trust estate, Springfield, O.—1,507,845.

Apparatus and Method for Admitting Gas Into a Vacuum. John B. Johnson, Elmhurst, N. Y., assignor to Western Electric Co., Inc., New York, N. Y.—1,507,919.

Foam Composition for Extinguishing Fires. Lewis B. Van Leuven and Harry C. Van Leuven, Woodbury, N. J., assignors to Vacuum Oil Co., New York, N. Y.—1,507,943.

Drying Apparatus. Harry S. Wood, London, England.—1,507,945.

Triple-Cushioned Valve. Edward V. Anderson, Monessen, Pa., assignor of one-half to Charles E. Golden, Crafton, Pa.—1,507,948.

Process of Preparing Oxy Compounds of Tantalum. Hugh S. Cooper, Cleveland, O., assignor to Kemet Laboratories Co., Inc.—1,507,987.

Process for the Production of Alumina and Nitrates. Hans J. Falck, Notodden, and Thor Mejdell, Skolen, near Christiania, Norway, assignors to Norsk Hydro-Elektrisk Kvaestofaktieselskab, Christiania, Norway.—1,507,993.

Process of Diluting Acids. James E. Egleson, Ridley Park, Pa., assignor to General Chemical Co., New York, N. Y.—1,508,015.

Corrosion-Resisting Ferrous Alloy. William H. Smith, Cleveland, O., assignor to Ludlum Steel Co., Watervliet, N. Y.—1,508,032.

Gas Filter. Fritz F. Uehling, Passaic, N. J.—1,508,034.

Vapor Conservation System. Charles P. Buck, Topeka, Kan.—1,508,048.

Process of and Apparatus for the Manufacture of Nitrogen Oxide. George A. Perley, Durham, N. H.—1,508,061.

Process for Treating Paper. David B. Davies, Green Bay, Wisc.—1,507,087.

Evaporator. Walter E. Sanger, Chicago, Ill., assignor to Wurster & Sanger, Chicago, Ill., a partnership firm.—1,508,130.

Sulphur-Containing Structure and Method of Making Same. William H. Kobbe, New York, N. Y., assignor to Texas Gulf Sulphur Co., Bay City, Tex.—1,508,144.

Electric Furnace. Edgar P. Collins, Schenectady, N. Y., assignor to General Electric Co.—1,508,164.

Apparatus for Washing Milk of Magnesia. Floyd E. Frazier, Iowa City, Iowa.—1,508,177.

Means for Impregnating Coils. Robert W. Hoff, Schenectady, N. Y., assignor to General Electric Co.—1,508,179.

Composition of Matter Comprising a Liquefied Gas. Pierre E. Haynes, Buffalo, N. Y., assignor to Linde Air Products Co.—1,508,185.

Process of Making Rustless Iron and Similar Alloys. Frederick M. Becket, New York, N. Y., assignor to Electro Metallurgical Co.—1,508,211.

Method of and Apparatus for Effecting Humidification. Ralph D. Morrison, Mattapan, Mass., assignor to Spray Engineering Co., Boston, Mass.—1,508,234.

Drier. Edgar B. Kerst, Providence, R. I., assignor to Proctor & Schwartz, Inc., Philadelphia, Pa.—1,508,283.

Treatment of Gases Containing Dust and Fume. Frederick W. Huber, Riverside, Calif., assignor, by mesne assignments, to Western Precipitation Co.—1,508,331.

Carboy. Charles Lefkowitz, Newark, N. J.—1,508,343.

Method and Apparatus for Producing Carbon Black. Chauncey Matlock, Brooklyn, N. Y., assignor to Monroe-Louisiana Carbon Co., Monroe, La.—1,508,367.

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Pectin Freed From Protein and Starch. Stuart L. Crawford, Rochester, N. Y.—1,507,338.

Margarine and the Process of Making Same. Marvin C. Reynolds, Oak Park, Ill.—1,507,426.

Process for Revivifying Filters. Matthew Russell, Greenock, Scotland.—1,507,521.

News of the Industry

Summary of the Week

Treasury Department refuses to issue anti-dumping order against German and Norwegian sodium nitrite.

Hoover advises the chemical industries to prepare to meet their pollution problems.

American Electrochemical Society will meet next week in Detroit.

Franklin Institute celebrates its centenary.

Dr. Wilbert J. Huff has been appointed professor of gas engineering at Johns Hopkins University.

Sodium nitrate imported in crude or refined state is entitled to admission free of duty.

Recommitment of the Prohibition Bureau bill will be urged at the first meeting of the Judiciary Committee following opening of Congress.

C. W. S. Reserve Corps in New York will organize a permanent association.

Executive committee of Manufacturing Chemists Association will urge adoption of universal screen scale.

Reserve Corps, C.W.S., in New York Area to Organize

Officers in the Reserve Corps of the Chemical Warfare Service in the Second Corps area took preliminary steps toward the organization of a permanent association at a dinner held at the Harvard Club, New York City, on the evening of Sept. 12, Defense Test Day. The meeting was attended by about fifty representatives of the regular army, the Officers Reserve Corps and the chemical manufacturing industries.

The purpose of the meeting was to make a rough survey of the chemical industries for the purpose of ascertaining their state of preparedness and readiness to serve in time of emergency. Brief addresses were made by Dr. Charles H. Herty for the Synthetic Organic Chemical Manufacturers Association, Robert T. Baldwin for the Chlorine Institute, Dr. Charles L. Reese for the American Institute of Chemical Engineers and H. C. Parmelee for the American Electrochemical Society. Dr. J. E. Zanetti, who has just returned from Europe, reported on the probable recognition by the League of Nations of chemical warfare as a means of combat. Committees have advised the League that it is impossible to avoid or outlaw chemical warfare, and while the final reports have not been made public, it appears likely that the League of Nations will accept the advice of the various committees that have been investigating the matter.

A committee was appointed to make recommendations regarding the type of reserve officers' organization that should be formed and its future activities. A further recommendation was made that a group of civilians in the chemical industries be appointed an advisory committee to the prospective reserve officers' association as well as to the officers of the regular army having charge of chemical warfare in the Second Corps area.

Franco-German Accord May Extend to Phosphates

The ready way in which the French and Germans bury the hatchet when an opportunity presents to make a mutually profitable commercial accord has aroused apprehension as to just how far such combines will go. The fear is expressed that this mutuality of interest is likely to extend from potash to phosphate. The French are much interested in expanding the market for Moroccan phosphate. The facilities for making this material available at lower prices than heretofore are going ahead rapidly. Even if no actual agreement is made, binding the Germans to prior use of Moroccan phosphate, the general trend toward commercial co-operation may threaten the principal foreign market of American phosphate producers.

Anti-Dumping Order Against Sodium Nitrite Refused

Notices were sent early last week from the Treasury Department to collectors of customs stating that the department did not feel justified in issuing an anti-dumping order against sodium nitrite imported from Norway and Germany. A petition had been filed in August by an American producer of nitrite, asking that an anti-dumping order against importations of this chemical be issued in accordance with the flexible provisions of the tariff act. Customs collectors also were advised that appraisement reports on imported nitrite should not be withheld. Sodium nitrite is one of the chemicals investigated by the Tariff Commission and on which a 50 per cent increase in duty was imposed. The report of the investigation has just been published.

To Request Recommitment of Prohibition Bureau Bill

At the first meeting of the Judiciary Committee following the convening of Congress Dec. 1, Senator Broussard of Louisiana will appear before it to urge the committee to request the recommitment of the Prohibition Bureau bill. This measure was rushed onto the Senate calendar in the closing hours of the last session. This action was taken on a simple poll of the committee, which had no time to give this important piece of legislation formal consideration.

The Louisiana Senator will point out to the Judiciary Committee that unfair tactics were used in securing passage of the measure by the House in its present form. Regardless of the sentiment among members of the Senate Judiciary Committee, he contends that there is now no reason why the bill should not be taken from the calendar and an opportunity be given its opponents, as well as its proponents, to present their views before the committee acts on the measure.

The bill provides for a separate bureau of prohibition in the Treasury Department, which would have the effect of removing from the Commissioner of Internal Revenue all control over industrial alcohol. The Commissioner of Internal Revenue has shown a disposition to be more reasonable in the matter of freeing trade alcohol from burdensome restrictions than have officials of the Prohibition Unit. The industry recognizes that it will be very difficult for officials charged primarily with the prevention of the use of alcohol in beverages to regard sympathetically the problem that confronts the manufacture and distribution of alcohol for legitimate purposes, especially as their estimates show that fully 5,000,000 wine gal. of industrial alcohol will be diverted for illegitimate purposes during 1924.

Electrochemical Society Meets in Detroit Next Week

The forty-sixth semi-annual meeting of the American Electrochemical Society will be held in Detroit, Oct. 2, 3 and 4, 1924. Headquarters will be at Hotel Tuller, Grand Circus Park, and all sessions will be held there excepting that on Friday evening, when Alex Dow, president of the Detroit Edison Co., will address the society at the Board of Commerce Auditorium.

An all-day symposium on "Corrosion" will be held Thursday, Oct. 2, under the chairmanship of Dr. B. D. Saklatwalla. Papers by some of the leading authorities of England and America are scheduled. A symposium on "Industrial Electric Heating" will follow on Friday. Round-table discussions on "Electric Furnace Cast Iron" and "Analytical Methods in Electrodeposition" will be held at the luncheons Thursday and Friday. The discussion on electric cast iron will be opened by Dr. Richard Moldenke.

Visits are scheduled to several power houses, electric steel plants and automobile factories. A "get-together" dinner on Wednesday evening and a smoker Thursday are prominent among the social features, which also include teas, bridge and automobile drives for the ladies.

Institute Co-operative Course in Industrial Chemistry

The Delaware State Vocational Department, assisted by chemical and affiliated industrial plants at Wilmington, is developing a 4-year course in industrial chemistry on a co-operative system, said to be the only such course of instruction in secondary schools throughout the country. The students will be divided into two groups; one of these groups will spend a month in the laboratory at a designated industrial plant in the city, while the other will spend the month in the new laboratory recently installed at the local high school. The companies interested in the movement have agreed to compensate the beginners on a basis of 20 to 30 cents per hour while engaging at their respective plants, with corresponding increase in pay as the student becomes more proficient, according to the merits of the individual. The monthly part-time alternating work will continue for the first 2 years of the course, with the remaining 2 years to be spent entirely in industrial plants. A special diploma will be issued by the Board of Education to those completing the course satisfactorily, and to encourage the students, the different industrial plants purpose to arrange scholarships to those showing exceptional merit and who may wish to continue their studies at college.

A curriculum for the new course has been formulated under the direction of Dr. W. Kirk, du Pont Dye Works; S. L. Shanaman, Jackson Laboratories; W. C. Holmes, E. I. du Pont de Nemours & Co.; G. W. Riley, Bancroft & Sons Co., and R. H. Nerton, Penn-Seaboard Steel Corporation, together with R. E. Bowman, chemical engineer, with the vocational department at the high school.

Mr. Bowman will be in charge of the new course of instruction, which will be inaugurated at an early date. Up to the present time, a total of seventeen students, all high school graduates, have enrolled for the course.

To Broadcast Chemistry Talks

The department of chemistry of the University of Pittsburgh will broadcast a series of radio talks from the University of Pittsburgh station KDKA beginning Oct. 8. The list of talks, scheduled for 8:15 p.m. each Wednesday, follows:

Oct. 8, "The Place of the Chemist in Our Everyday Life," by Alexander Silverman, head of the department of chemistry.

Oct. 15, "The Air We Breathe and the Water We Drink," by Kendall Siebert Tesh, instructor in inorganic chemistry.

Oct. 22, "The Food We Eat," by Charles Glen King, professor of sanitary chemistry.

Oct. 29, "Coal, a Factor in Industry and Health," by Alexander Lowy, professor of organic chemistry.

Nov. 5, "Heat and Cold, What They Mean to Us," by Gebhart Stegeman, professor of physical chemistry.

November, 12, "Glass, One of Man's Blessings," by Alexander Silverman.

A bulletin has been prepared outlining briefly the lectures and containing a list of reading references. This may be obtained by addressing the radio manager, University of Pittsburgh, Pittsburgh, Pa. The lectures will be printed in a bulletin at the close of the series and may be obtained at the same address.

Huff Appointed Professor at Johns Hopkins

Johns Hopkins University has just announced the appointment as professor of gas engineering of Dr. Wilbert J. Huff, lately of the Koppers Co., Pittsburgh. Dr. Huff has already assumed the duties of his new position and will have charge of the organization and instruction of the new courses in gas engineering at the university.

Dr. Huff was born in Butler, Pa., on Oct. 4, 1890. He is an honor graduate of Yale College, class of 1914, and received the rating of philosophical oration, which is the highest honor awarded. He also received special honors in chemistry. He took the degree of Doctor of Philosophy at Yale in 1917. While a graduate student at Yale he was Henry Bradford Loomis Fellow, a high honor, and during this period he engaged in teaching.

Since 1917 Dr. Huff has been engaged in chemical and engineering research with The Barrett Co., the United States Bureau of Mines and the Koppers Co. He was a Lieutenant in the Chemical Warfare Service in command of the Princeton research detachment. Since 1920 he has been with the Koppers Co. in charge of the research division of that company's laboratories. He has had under his direction a number of men engaged in various research problems connected with the byproduct coke and gas industry, some in the laboratory, others in the field.

A.I.M.E. Goes to Birmingham Oct. 13

About 200 members of the American Society of Mining and Metallurgical Engineers are expected to leave Washington on the special train bound for the 130th meeting of that society to be held in Birmingham, Ala., Oct. 13, 14 and 15. Stops will be made for visits to several industrial works in Tennessee. Convention headquarters will be at the Tutwiler Hotel, from which many side trips will be made to various industrial plants in Alabama during the 3 days that the engineers are Birmingham's guests.

Sir William Ellis, president of the British Iron and Steel Institute, will be the guest of the convention and one of the principal speakers at the banquet at the Country Club.

Among the papers that are being prepared for the program, the following have been announced:

"Alabama Coal-Mining Practices," Milton H. Fies, vice-president of the DeBardeleben Coal Corporation; "Coal-Washing Practices in Alabama," Henry S. Geismar, mining engineer, Keiser-Geismar Co.; "Byproduct Coking in Alabama," Frank W. Miller, manager, oyproduct plant, Sloss-Sheffield Steel & Iron Co.; "Blast-Furnace Practice in Alabama," Howard E. Munsey, superintendent furnaces, Woodward Iron Co.; "Effect of Sulphuric in Blast-Furnace Practice," T. L. Joseph; "Production of Sponge Iron," Clyde E. Williams, Edward P. Barrett, Brevart M. Larsen; "Manufacture of Cast-Iron Pipe in the South," Richard Moldenke; "Geology of Birmingham Iron Ores," E. F. Burckhard; "Iron Ore Mining Methods," and "Roof Supports in Red Ore Mines of Birmingham District," W. R. Crane, United States Bureau of Mines and Southern Experiment Station; "Beneficiation of Low-Grade Alabama Ores," "Geology and Utilization of the Tennessee Phosphate Rock."

William Kelly, with offices in New York, is president of the institute. From Birmingham the delegation will go to Muscle Shoals to inspect the government work there.

Standard Screen Scale Favored

The executive committee of the Manufacturing Chemists Association at a meeting on Sept. 17 went on record as favoring the adoption of a standard screen scale. At the present time there are three scales in extensive use in industrial work. They are the American Society of Testing Materials standards, the Bureau of Standards scale and the W. S. Tyler Co. scale. The mining industry of the country is said to favor the Tyler scale and many other interests also approve it.

The executive committee does not recommend any particular standard at this time, but believes that much of the confusion would be avoided if one scale could be adopted.

The committee plans to get in touch with other organizations before taking action and the secretary will ask the co-operation of the Paint, Oil and Varnish Association and the Rubber Association in its preliminary study.

Washington News

Hoover Advises Industries to Study Pollution Problems

Secretary Hoover's warning that industries must prepare to meet the pollution problem indicates that this friend of industry, who was chiefly responsible at the last session of Congress for the confining of legislation to oil pollution, is convinced that early action aimed at factory wastes may be expected. Thus forewarned, it is believed that the industries now using streams for the discharge of any waste will be well advised to begin now the study of how other disposition can be made of polluting materials. It is recognized that there are discharges from factories that result in no detrimental effects. If that is the case it is suggested that the proof necessary to substantiate it should be collected and put in finished form. In other instances it is known that the chief polluting element comes from mine waters which cannot be excluded from the stream and the neutralization of which would occasion prohibitive costs. Under such circumstances it would be useless for a factory to incur great expense in making other disposition of a discharge when the pollution of the stream is inevitable from other causes that are beyond practical control.

All such facts should be made ready in perfected form for presentation, on short notice, to Congressional committees, it is suggested. The Manufacturing Chemists Association already is taking systematic steps to that end.

Higher Potash Prices Would Encourage Prospecting

The Department of Commerce is being criticised for its suggestion that steps be taken to meet the action of the German and the French potash producers in apportioning among them the requirements of the United States. It is asked why such a suggestion is brought forward when we have no way to combat the combine.

There is little sympathy in government quarters with the intimations that we should remain inactive and say nothing, in the fear that it might rouse the potash combine to penalize us for our temerity in proposing to take steps in our own defense. There is no fear of any immediate boosting of prices, despite the fact that we are, at this time, largely at the mercy of the combine. As a rule such associations of producers, it is pointed out, are not particularly scrupulous and would take all the traffic would bear, were there no danger of jeopardizing their market in the future. In this instance it is predicted that there will be no crude handling of the situation. Prices will be kept at a very low level, it is believed, in the hope that prospecting for potash in the United States will be discouraged, so that American capital will not be tempted to undertake potash production in Spain or Africa. There is the

additional reason that low prices will tend to establish the potash-using habit.

It is known that the German and French producers have been profoundly impressed by the geological facts which have been developed to show that the formation in our Southwest is highly favorable to the occurrence of potash deposits. It also is known that they were much alarmed when the Senate at the last session passed the Sheppard bill, which authorized the expenditure of \$500,000 for potash prospecting. They are keenly alive to the fact that an increase of price, following their agreement, would be the best way to insure prompt action on this legislation in the House. The official reaction to the criticism that has arisen from American sources is that we have ways of defending ourselves and that we are prepared to make use of them. In this connection it is understood that Senator Capper expects to push his bill, which would permit consumers to make such purchases through a single agency.

Larger C.W.S. Appropriation Sought by Industry

Evidences are many that the chemical industry is very hopeful that budget officials and Congress will be more generous this year than they were last in the matter of appropriations for the Chemical Warfare Service. Its appropriations have been reduced to the point where it is receiving only \$700,000 during this fiscal year. To an agency that must provide a large amount of equipment for the use of the army this amount leaves very little for research work, which is regarded as just as important in the national defense as is the supplying of the army with gas masks.

Because of lack of funds research work lagged greatly last year and necessarily must lag even more this year. This policy as to appropriations is in decided contrast with that of Japan. Japan was not in a position to appropriate more money for the army, so it reduced its military strength by four divisions so as to have funds available for chemical research and the development of tanks and airplanes.

Treasury Decision Grants Free Entry for Sodium Nitrate

Sodium nitrate, whether imported in a crude or refined state, is entitled to admission free of duty, the Secretary of the Treasury has ruled. Secretary Mellon's opinion is a source of great relief to the National Fertilizer Association and the Manufacturing Chemists Association, which recognized that paragraph 1667 of the tariff act is susceptible to the construction contended for by Battelle & Renwick, manufacturing chemists of New York. This firm subjects imported nitrate of soda to a refining process, so as to make the commodity more suitable for use in the

packing industry. Recently W. R. Grace & Co. became a competitor in the field of packing house nitrate with a product which had undergone special refinement in Chile. It was this competition that prompted the New York firm to contend that free list paragraph 1667 applies only to the crude product and that any refining subjects it to the 25 per cent ad valorem duty, provided in paragraph 5 of the chemical schedule, which is the basket clause.

Had the protest been upheld, it would have made dutiable all sodium nitrate above the 95 per cent product. This would have affected half of our annual importations, or about 400,000 tons. In the connection, however, attention is called to the fact that had the protest been upheld imports would have been confined largely to material containing less than 95 per cent of nitrate of soda. At best, however, it would have meant losses and inconvenience to the fertilizer industry, to the manufacturers of acids, to the explosives manufacturers and to the glass makers. For that reason the National Fertilizer Association and the Manufacturing Chemists Association spared no effort in attempting to overthrow the case of the protestants. In his decision Secretary Mellon, among other things, said:

"While there may be some force in the argument advanced that the phrase, as appearing in paragraph 1667, is susceptible to the construction contended for by the domestic interests, the department is satisfied that if Congress had intended to depart from a uniform classification which had existed for over half a century, some evidence of that intention would be found either in the published tariff hearings or in the discussion of the paragraph on the floor of one or the other of the houses of Congress. The department has been unable to find anything in the hearings or in the discussions in Congress to show that any suggestion, much less recommendation, was made to limit to free entry nitrate of soda crude, and to transfer refined nitrate of soda to the dutiable list. Moreover, if Congress had intended to subject refined nitrate of soda to duty, it is reasonable to assume that it would have provided for the article by name, as was done with sulphate of soda, crystallized, in the act of 1913, and in paragraph 83 of the present tariff act, rather than to leave the nitrate of soda, refined, to fall under the catch-all provision in paragraph 5 of the present tariff act for chemical salts not specially provided for."

Chemical Preparation Used as Dust Preventive

A chemical preparation is being used successfully in Switzerland as a preventive of dust on roads and streets, according to advices to the Department of Commerce. It is spread by means of an ordinary street sprinkler. The cost of the material is so low, it is stated, that it can be used generally. While it must be renewed after a hard rain, it forms a crust that will withstand ordinary wear for a considerable period when the weather is dry. The Consul makes no reference to the composition of the preparation.

Hendrick Made Curator of Chandler Museum

As previously reported in these columns, Dr. Ellwood Hendrick, former consulting editor of *Chem. & Met.*, internationally known for his popular writings on chemistry, has been appointed curator of the Chandler Chemical Museum at Columbia University. Dr. Hendrick's appointment will take effect Oct. 1.

The Chandler Museum has been built up over a period of more than 50 years by Prof. Charles F. Chandler, dean of American chemists, now in his eighty-eighth year. It consists, said Prof. Daniel D. Jackson, executive officer of the department of chemical engineering, of the raw and finished products of manufacture of most of the important industries of this and other countries. The collection is said to be of great importance as a reference for manufacturers and students and for the illustration of lectures. It is also much used for small quantity specimens by students.

Dr. Hendrick will reclassify the various collection and write monographs on each.

Dr. Hendrick was born in Albany, N. Y. He studied in Zurich during 1878-81, after which he became superintendent of the Albany Aniline & Chemical Works. He then became a member of the staff of the Arthur D. Little Co. and was for some years consulting editor of *Chem. & Met.* Dr. Hendrick, who resides in New York City, is a member of the American Chemical Society and a past president both of the Chemists Club of New York and the Société de Chimie Industrielle.

Subjects for A.C.S. Symposiums Announced

Three symposiums will feature the next three semi-annual meetings of the Division of Industrial and Engineering Chemistry of the American Chemical Society, according to plans perfected at the recent Ithaca meeting. The first of these, at Baltimore, April, 1925, will be on Corrosion, for which Robert J. McKay, of the International Nickel Co., is to be chairman. At the Los Angeles meeting, in August, 1925, "Chemical Technology of the West" is the subject assigned to Chairman Charles A. Newhall, consulting chemist, of Seattle. At the spring meeting for 1926, Lubrication will hold the center of the stage and Dr. R. E. Wilson, of the Standard Oil Co. of Indiana, will act as chairman.

At the absorption symposium during the Ithaca meeting the division authorized the appointment of a special committee on nomenclature for the problems of absorption.

Export Company Reincorporated

Reports from Akron, state that the Goodyear Export Co., a subsidiary of the Goodyear Tire & Rubber Co., has been reincorporated at a capitalization of \$6,615,000. The new corporation will be known as the Goodyear Rubber Plantations Co.

News in Brief

A. I. C. E. Considers Joint Meeting With English Engineers—The American Institute of Chemical Engineers has received an invitation from Sir Arthur Duckham, president of the Institution of Chemical Engineers (England), to hold a joint meeting in England in July, 1925, following the Providence meeting of the American organization. The secretary of the American Institute is now canvassing the members to see whether a sufficient number would attend a meeting in England to make a joint session successful.

Italian Chemical Exhibition Postponed—Italy's National Exhibition of Pure and Applied Chemistry, which was to have been held this fall at Turin, has been postponed until spring. It was found that the task of assembling the exhibits was greater than had been estimated. Because of the postponement, however, the scope of the exhibition will be expanded.

Unsatisfactory State of German Dyestuff Industry—In a report from Berlin, William T. Daugherty, U. S. trade commissioner, states that conditions in the German dyestuffs industry are reported as not altogether satisfactory. The manufacture of intermediates as well as dyes has had to be curtailed somewhat, as stocks have accumulated and the outlook for sales in the immediate future is not encouraging. Lucius & Bruening, or the Hoechst Farbwerke, at Hoechst am Main, have been forced to lay off from 10 to 15 per cent of their help on account of the stagnant condition of business.

Oil Refineries Resume Operations—The Sinclair Refining Co. has resumed operations at its oil refineries at Coffeyville and Argentine, Kan., and Cushing, Okla., following a suspension for several months. It is expected to develop full capacity at an early date with regular working quota. The production schedule will be maintained for an indefinite period.

Germany Produces New Fireproof Paper—A new non-flammable paper is being produced in Germany. It is believed that this simply applies to paper a treatment such as has been used with great success in this country in connection with the fabrics used on airplane wings. At the same plant where the non-flammable paper is being produced varnishes are being manufactured for which fire-retarding claims are made.

Spain Discovers Phosphate Resources—According to a Reuter dispatch from Murcia, Spain, phosphate deposits have been discovered in the Sierra de Espuña. The deposits are estimated to contain millions of tons of phosphates and steps are being taken to form a company for their exploitation.

Alberta Salt Plant Ready to Produce—The new salt industry at Fort McMurray, Alta., is expected to commence shipping its products soon. The plant

Engineers and Scientists Celebrate Franklin Institute Centennial

For the purpose of celebrating the one hundredth anniversary of the founding of the Franklin Institute, there was gathered in Philadelphia from Sept. 17 to 19 a most distinguished group of scientists and engineers—remarkable not only for the prominence of those in attendance but for the wide range of countries and phases of science represented. Delegates were present from more than 100 universities and colleges throughout the world, from nearly 100 learned and professional societies and from about 100 American industrial organizations—a most unusual and remarkable group.

Following the academic procession from the Hall of the Franklin Institute to the Walnut St. Theater on Wednesday morning, the delegates and guests were welcomed by Mayor W. Freeland Kendrick, of Philadelphia. Dr. William C. L. Eglin, president of the Institute, responded and introduced Prof. Elihu Thomson, who reviewed the history of the Institute, with particular emphasis on electrical developments during this eventful period.

In the afternoon there were four simultaneous sectional meetings devoted to technical subjects. Abstracts of some of the papers presented at these meetings and at the other technical sessions will be given in our next issue.

Thursday morning was given over to sectional meetings, with a garden party at the Philadelphia Country Club in the afternoon. In the evening more than 1,000 crowded the auditorium of the University Museum to hear Prof. Sir Ernest Rutherford discuss in remarkably understandable fashion some of the latest developments in his work on the natural and artificial disintegration of elements. President Eglin presided, while former Governor William C. Sproul of Pennsylvania acted as chairman.

Inauguration exercises of the Bartol Research Foundation were conducted Friday morning, with addresses at the Academy of Natural Sciences by Dr. Arthur D. Little and Prof. D. S. Jacobus. In the afternoon several honorary degrees were conferred at the University of Pennsylvania and the meeting closed in the evening with a banquet at the Bellevue-Stratford.

is nearly ready for operation and the basis of the industry is assured, a vein of salt 84 in. thick having been encountered at a depth of about 500 ft.

Texas Plans New Chemistry Building—The board of regents, University of Texas, Austin, Tex., has preliminary plans in progress for the proposed new chemistry building at the institution, to be constructed under a unit plan with ultimate size and cost still to be determined. It is said that the new building will be the largest on the campus, replacing the present chemistry structure built in 1891. Bids are expected to be asked for the initial erection at an early date, and purchases of equipment made for the laboratories and other departments.

Financial

Net profit of Devoe & Raynolds Co., Inc., for 6 months ended June 30, was \$686,872, equivalent, after allowing for preferred dividend requirements, to \$14.62 a share earned on 4,000,000 outstanding common stock. Gross business was slightly better than \$6,200,000, a small gain over the first half of 1923.

The report of Standard Plate Glass Co. for 6 months ended June 30 shows net profit of \$683,157 after expenses, interest and depreciation, equivalent after allowing for preferred dividend requirements to \$2.06 a share earned on outstanding 200,000 no par common shares.

The General Asphalt Co., through a syndicate, is to refund its 8 per cent debentures, offering an issue of \$5,000,000 6 per cent 15-year debentures at 97½. Stockholders will have the privilege to subscribe to the issue up to Oct. 6 before public offering.

The Tidal Osage Oil Co. for 6 months ended June 30 reports surplus of \$250,979, after all charges, compared with deficit of \$89,330 in same period of 1923.

Costa Rica Calls for Bids on Fertilizer Materials

The Costa Rican Government has called for bids on the following fertilizer materials: 30 tons sulphate of ammonia; 100 tons muriate of potash; 50 tons sulphate of potash; 50 tons superphosphate of lime, 16 to 17 per cent; 30 tons double superphosphate, 42 per cent or more; 10 tons of thomas meal; 20 tons mixed fertilizer, 18 per cent ammonia and 14 per cent potash; 5 tons dried blood in powder; 20 tons calcium nitrate. Bids will be opened Oct. 15. Bids are to be sent to "Oficial Mayor, Secretari de Hacienda, San Jose." Payment will be in cash on delivery c.i.f. Limon or Punta Arenas.

Graphite Production Grows

Establishments engaged primarily in the manufacture of graphite had combined outputs valued at \$2,184,609 in 1923, an increase of 49.9 per cent over the 1921 output, according to returns just compiled from the census of manufacturers for 1923. During that year the number of persons engaged in the industry increased 46.2 per cent, salaries and wages increased 48.6 per cent, cost of materials increased 53.8 per cent and the value added by manufacture increased 46.3 per cent.

Mexico in Market for Narcotics

An American concern in Mexico which does a large business with the Mexican Government in the furnishing of medical and other supplies for government hospitals is not able to fill orders for narcotics in that country. No permits for the export of American-made narcotics are granted to countries not signatory to the international narcotic agreement. Mexico has not joined in that agreement.

Fertilizer Made From Edible Fish May Be Banned

Court action is in progress by the California State Fish and Game Commission to restrain three fertilizer manufacturing companies operating in the Monterey district from converting fish, said to be fit for human consumption, into fertilizer. A permanent injunction is asked. In the complaint filed by the commission it is set forth that the Carmel Canning Co., the Bay Side Fish Flour Co. and the Monterey Fish Products Co. are operating without a permit to run fish of the character noted through reduction plants for fertilizer and fish meal. As a protection to the fishing industry of the state, which is estimated to run close to \$15,000,000 per annum, the amount of edible fish that can be converted into fertilizers, etc., has been strictly limited by the commission. The court case is being prosecuted under a recent state law and a late Supreme Court decision, declaring the fish of the state to belong to the people.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ACID, ACETIC. Rosario, Argentina. Agency.—11,579.

CHEMICALS, HEAVY. Hamburg, Germany. Purchase.—11,580.

DYES, especially synthetic indigo. Bushire, Persia. Purchase.—11,573.

CHEMICAL FERTILIZERS, Point-a-Pitre, Guadeloupe. Agency.—11,612.

PAINTS AND VARNISHES, dry colors, and oils. Calcutta, India. Purchase and agency.—11,581.

CAUSTIC SODA. Rosario, Argentina. Agency.—11,579.

COTTONSEED OIL. Hamburg, Germany. Purchase and agency.—11,570.

American Firms Asked to Invest in Brazil

American concerns dealing in pharmaceuticals are being asked to subscribe for stock in a company operating a central laboratory in Rio Janeiro. This particular laboratory is represented to be a going concern owned co-operatively by physicians and other users of pharmaceuticals in the Brazilian capital. While nothing is known in official quarters as to the financial responsibility of this particular company, it is pointed out that this laboratory is typical of a more general development of this idea. Those interested in the extension of our foreign trade are inclined to believe that our exporters will be well advised to interest themselves financially in such institutions, provided the financing is on a sound basis. In fact, the thought is advanced that American exporters could encourage the idea in other foreign cities. By assisting in the financing of such a laboratory they would be given a voice in its conduct and might be able to confine its purchases to American products.

Trade Notes

C. F. McKenna, formerly with the Federal Phosphorus Co., has joined the sales department of the Commercial Solvents Corporation.

H. B. Moore, who has been prominent in the vegetable oil business for several years, has joined the staff of Irving R. Boody & Co.

Buck, Kiaer & Co., Inc., of New York has been appointed sales agent for fluorspar for George G. Blackwell Sons & Co., Ltd., Liverpool, England. Mr. Buck was formerly sales representative of the British-American Nickel Corporation, Ltd., and Mr. Kiaer is a man of wide shipping experience.

Defense Day gave great impetus to the Reserve Corps movement. Chemical Warfare Service reserve organizations were established at New York, Chicago and San Francisco. Large numbers of individual applications for commissions have been pouring in since the demonstration on Sept. 12.

Reichard-Coulston, Inc., 95 Madison Ave., New York, paints, varnishes, etc., has acquired the plant and business of Henry Erwin & Sons, Bethlehem, Pa., specializing in the production of metallic and other paints and grinding of imported umbers.

The average monthly export of palm oil from Sumatra East Coast for the first 5 months of 1924 indicates an increase of more than 50 per cent over the average monthly shipment of this product in 1923. During the first 5 months of this year 1,780 metric tons of palm oil was exported, as against 2,717 metric tons for the entire year 1923. Exports to the United States largely consisted of trial shipments.

Canadian Mineral Production Continues to Grow

According to a report just issued by the Bureau of Statistics, Canada's metallic mineral production for the first 6 months of 1924 showed an increase of 20 per cent over the same period last year. Increased production values were made by coal, silver, nickel, lead and arsenic among the metals, and by feldspar, gypsum, mica and natural gas among the non-metals. Copper and asbestos showed increased production, but a lower value. Coal showed the largest decrease in quantity production, being 2,000,000 tons less than in the same period last year.

Salt production increased more than 13,000 tons to a total of 102,894 tons, valued at \$730,839. The demand for arsenic as an insecticide continued. The total production was nearly three million pounds, valued at \$360,868. The recovery of metals belonging to the platinum group, following the increased production in the nickel-copper industry, showed an appreciable advance over the figures for last year; the total recovery was valued at \$152,535.

Men You Should Know About

E. O. BARSTOW, production manager at the plant of the Dow Chemical Co., Midland, Mich., gave an interesting address recently before a gathering of business men at Saginaw, Mich., descriptive of operations at his company's plant.

Dr. BENJAMIN T. BROOKS, formerly with the Mathieson Alkali Co., has severed his connection with that organization to engage in consulting practice. He will be absent from New York much of the time, but his mail address will be 50 East 41st St., New York, N. Y.

E. I. DYER, technical director for the Union Oil Co. of California, Los Angeles, has resigned. He has been connected with the company in various capacities since 1909, particularly in charge of refining operations, acting as technical director for 2 years past.

WILLIAM ERNST, of Demopolis, Ala., has been appointed chemist at the new South Dakota state cement plant at Rapid City, and will take up his duties at an early date.

Dr. ROCCO FANELLI, who completed his undergraduate and graduate education at Columbia University in 1924 and who has taught at Columbia University, is now connected with the chemical staff at the Polytechnic Institute, Brooklyn, N. Y.

FRITZ HABER, of Berlin, Germany, noted chemist and co-inventor of the process for fixation of nitrates from the air, is now in the United States and will go to Japan before returning to his native land. He lectured at the anniversary exercises of the Franklin Institute, Sept. 17.

Sir WILLIAM JONES, chairman of the research committee of the British Refractories Association, is now on a visit to the United States.

MORRIS LAWRENCE, formerly chief chemist for the Hudson Coal Co., of Scranton, Pa., has left the employ of that company and is now engaged in practice in Scranton as a consulting chemical engineer, with offices at 301-302 Mears Building. Mr. Lawrence, who is a graduate of Lehigh University in chemical engineering, will specialize on the chemical and research problems of the anthracite industry and in addition will carry on a general consulting chemical engineering practice.

ROYAL K. MEEKER, Pennsylvania State Secretary of Labor since Feb. 26, 1923, has tendered his resignation to Governor Pinchot, to become effective Oct. 15.

Dr. ALDEN H. MOODY has joined the chemical staff of the Polytechnic Institute, Brooklyn, N. Y. He is a graduate of New Hampshire College, 1919, with the degree of B.S. and Cornell University in 1923, with the degree of Ph.D. Dr. Moody was a half-time instructor at Cornell University from

1919 to August, 1923. From October, 1923, to December, 1923, he was employed by E. I. du Pont de Nemours & Co. in their Arlington plant on analytical control work. Since December, 1923, he has been assistant research chemist doing electrochemical work at the Union Carbide & Carbon Research Laboratories, Long Island City, N. Y.

W. E. MUNTZ has resigned as chemist with the American Cyanamid Co., Niagara Falls, Ont., to become instructor in physics and mathematics at Clemson Agricultural College.

EDWARD PITCAIRN, treasurer of the Pittsburgh Plate Glass Co., Pittsburgh, Pa., has returned from a trip to Europe.

C. O. STEWART, of Zanesville, Ohio, has become manager for the Fraunfelder China Co., of the same city.

New members of the teaching staff of the University of Maine, department of chemistry and chemical engineering, are Dr. Carl Otto as assistant professor, Dr. W. N. Greer as instructor, J. F. Goggin as instructor and Miss Pauline Perkins as assistant instructor. Dr. Otto was last at the University of Cincinnati, Dr. Greer at Clark University and Brown University under C. A. Kraus, Mr. Goggin at New Hampshire State University and Miss Perkins at the Nela Research Laboratories.

Calendar

AMERICAN CERAMIC SOCIETY, Los Angeles, Calif., Oct. 6 to 7.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN FOUNDRYMEN'S ASSOCIATION, Milwaukee, Wis., Oct. 11 to 16, 1924.

AMERICAN GAS ASSOCIATION, Steel Pier, Atlantic City, N. J., Oct. 13 to 17.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Hotel Shenley, Pittsburgh, Pa., Dec. 3 to 6.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pasadena, Calif., Oct. 13 to 17.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Birmingham, Ala., Oct. 13 to 15.

* AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York, Dec. 1 to 4.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, New York, Dec. 1 to 3.

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, Hotel Raleigh, Washington, D. C., Oct. 20 to 22.

EDWARD HART CELEBRATION AND INTERSECTIONAL MEETING OF AMERICAN CHEMICAL SOCIETY, Easton, Pa., Oct. 16 to 18.

MANAGEMENT WEEK, Auspices of American Society of Mechanical Engineers, New York City, Oct. 20 to 25.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 1 to 4.

RENSSELAER POLYTECHNIC INSTITUTE, Centennial Celebration, Troy, N. Y., Oct. 3 and 4.

SOUTHERN EXPOSITION, Grand Central Palace, New York, Jan. 19 to 31, 1925.

TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, Hotel Statler, Buffalo, N. Y., Oct. 14 and 15.

British Malaya to Develop Palm Oil Industry

In a report from Consul-General E. L. Harris at Singapore, it is stated that in tropical countries industries frequently rotate, one commodity being developed for a number of years, then a new industry takes its place. In the Straits Settlements this is constantly taking place. Years ago coffee was the main industry, then there was a shift to sugar, and 20 years ago the newly introduced rubber in Malaya began crowding out the rice paddies and coconut plantations. Now many planters have started the cultivation of oil palm in place of rubber. The oil palm thrives in the same soil as rubber and there will be no difficulty in producing it in the Straits Settlements. There is now 5,000 acres under actual cultivation in the Federated Malay States, and one-fifth of this area is bearing. The export of oil and kernels has already begun. The quality of the oil is excellent and there has been a good demand locally for palm oil, as well as in England. The manufacture thus far, however, has been entirely by hand machinery.

St. Boniface Alcohol Plant Begins Operations

The Canadian Industrial Alcohol Co. of Manitoba, a subsidiary company of the Canadian Industrial Co. of Montreal, has just completed and put into operation a plant at St. Boniface, a suburb of Winnipeg. The Manitoba company is capitalized at \$2,000,000 and was financed by the parent company, neither bonds nor stock being offered for public subscription. The new plant is intended to supply the needs of western Canada.

Italy Has New Ammonia Plant

There was recently founded a synthetic ammonia plant in Italy under the name of Sarda Ammonia e Prodotti Nitrici of a capital of 100,000 lire. It is announced that the company has extended its capital to 10,000,000 lire. Its council of administration comprises Guido Donegani, of the Montecatini company, Signor Toeplitz, of the Banca Commerciale d'Italia and Signor Balzarotto, of the Credito Italiano, and is said to present every indication of being one of those consortiums of banking and commercial interests to which the new Italy is fast giving place.

Obituary

EDWARD HILTON BROWN, of London, England, a chemist connected with the firm of McGuire, Patterson, Palmer & Co., British match manufacturers, died in Toronto, Sept. 12, following a brief illness. For 2 years he was an executive of the company's branch at Pembroke, Ont.

DEMING JARVIS, president of the Michigan Carbon Works, Detroit, Mich., died recently at Val Fleuri, France, aged 85 years.

Market Conditions

Treasury Decisions Have Bearing on Sodium Products

Refusal to Grant Anti-Dumping Order Aids Imported Nitrite of Soda —Refined Nitrate of Soda Held Not Dutiable

INTEREST in sodium products was increased last week as a result of rulings made by the Treasury Department. One ruling refused to sustain a petition for an anti-dumping order against German and Norwegian nitrite of soda. This clears the way for a resumption of shipments of this chemical from foreign markets. The second ruling declared that refined nitrate of soda was entitled to admission to this country without the paying of import duty. It is too early to estimate the results of the latter decision but it is held in some quarters that nitrate refined in Chile will become more of a factor in domestic markets.

Trading in chemicals during the week was of fair volume with small lot buyers more in evidence. Reports of widening activity in different manufacturing lines are borne out by the freer movement of chemicals against existing contracts. The improvement in trade has not been rapid but reports indicate a gradual gain in tonnage for most of the chemical products.

Interest is keen in contract prices for delivery over next year and consumers of caustic soda and soda ash are awaiting new prices which are said to be about ready for announcement. Some interest is shown also in contract values for bichromates. The recently established contract prices for potash salts have resulted in bringing buyers into the market, although criticism is heard of the combination between French and German producers, which establishes prices on a non-competitive basis.

The weighted index number has failed to steady and was again lower for the week. The number is still influenced by the declining market for cottonseed oil which more than offset rises in denatured alcohol and miscellaneous chemicals.

Acids

Call for mineral acids shows an improving tendency. Deliveries of sulphuric acid are said to be more consistent. The higher grades of sulphuric are finding a broader outlet in industrial lines and fertilizer grades also have sold more freely. In some cases makers of low grade acid are sold ahead over the remainder of the year. Nitric acid was not under as heavy selling pressure as sulphuric in the summer months and has continued to maintain a fairly steady price level. Muriatic acid is in large supply but accumulations have been lessened and

selling prices are more constant. Citric and tartaric acids are quiet at present and price concessions have been available. Oxalic acid is reported as steady but sellers were ready to cut prices so recently that it is difficult to say whether the market has passed this stage. Imported chromic acid is in plentiful supply with sales reported at 12c. per lb. Lactic acid is moving

Denatured Alcohol Advanced in Price—Caustic Potash Steady—Caustic Soda Easy in Price for Export—Barium Chloride Higher—Bichromates Irregular—Epsom Salt Firm—Competition Looked for in Refined Nitrate of Soda—New Contract Prices for Alkalis Awaited

steadily and presents a firm appearance. Acetic acid is said to have been in better demand for export and domestic consumers are taking on larger supplies without any material effect on market values.

Potashes

Caustic Potash—While a few sales of spot caustic were reported at 6½c. per lb., the market generally has held firm and 6½c. per lb. is the open quotation. Demand has been fair but many consumers have placed bids under sellers' views and this has restricted trading somewhat. Shipments from foreign points are quoted at 6½@6¾c. per lb., according to seller.

Chlorate of Potash—There has not been much demand for spot chlorate and the light stocks in sellers' hands are proving ample. Prices are given at 7@7½c. per lb., according to seller and quantity. Foreign markets are showing a firm front and the best price heard was 7c. per lb.

Permanganate of Potash—Demand has not been heavy and imported material has been easy in tone. Sales are said to have been made under 13c. per lb., with open offerings at 13c. per lb. Forward deliveries have been offered at 12½@12¾c. per lb. and these prices have helped to take away interest from the spot market.

Prussiate of Potash—Red prussiate of potash is quiet with prices showing a range from 36c. to 37½c. per lb., according to seller and quantity. Yel-

low prussiate is selling only in a moderate way on spot at 17c. per lb. Offerings for shipment from abroad are available at 16½c. per lb. but no large business was noted.

Sodas

Acetate of Soda—Some producers are reported to have cleaned out surplus stocks but in other quarters supplies are still large and higher prices have been checked by the readiness with which certain sellers have quoted the former levels. Round lots are offered at 4½c. per lb. at works and smaller lots carry a graded price scale.

Bichromate of Soda—The recent lowering in prices has taken some sellers out of the market and this is regarded as proof that current quotations are very close to production costs. There are offerings of round lots at 6½c. per lb. with some first hands giving 7c. per lb. as their inside figure. Demand has been stimulated by the lower prices and some inquiry is reported for contracts covering distant deliveries but no new contract prices have been openly announced.

Caustic Soda—Main interest in this material is centered in new contract prices which are about to be named. Producers have stated that they are taking up this question and some reports say the new prices will be made public in a few days while others look for the new schedules about Oct. 1. There was no real change in the market during the week and export business still shows a range in asking prices according to seller. The lowest price heard was 2.80c. per lb., f.a.s. Deliveries to the domestic trade are reported as large and former contract prices of 3.10c. per lb. are repeated.

Cyanide of Soda—Both imports and exports of this material have shown a falling off this year but the declines were not large in view of general conditions and competition between the foreign and domestic products does not appear to work against either. Standard domestic cyanide is said to be selling normally at 22c. per lb. Imported grades vary in price according to strength.

Nitrate of Soda—Trade circles were interested in ruling made last week by the Treasury Department to the effect that both crude and refined nitrate of soda were entitled to free entry. This action may result in keener competition among sellers of the refined product. Demand for spot nitrate has been quiet and prices have eased off as stocks increased in volume. Offerings were available at close to \$2.40 per 100 lb., with \$2.46 per 100 lb. as an open quotation.

Nitrite of Soda—Offerings of imported nitrite are expected to improve

in volume as the petition asking for an anti-dumping order against German and Norwegian material has been denied. In the meantime domestic nitrite is scarce with 9½c. per lb. asked at works. Imported nitrite has varied in price according to seller and grade, with 9@9½c. per lb. representing sellers' views.

Prussiate of Soda—Spot offerings of imported prussiate of soda have been free and buyers have not taken much interest. Trading is reported as quiet and spot holdings were barely steady at 9½c. per lb. Forward positions were offered at 9c. per lb.

Soda Ash—This material has been maintained on a steady price basis and recent buying is reported to have cut into surplus holdings and to have placed the market in a better position. Various consuming trades are taking normal amounts. New contract prices are expected to be announced soon. Current quotations are on a basis of 1.25c. per lb. for light ash in bulk; 1.38c. per lb. in bags; and 1.63c. per lb. in bbl. These prices are for carlots at works. Contract prices for dense ash are 1.35c. per lb. in bulk; 1.45c. per lb. in bags, and 1.69c. per lb. in bbl.

Miscellaneous Chemicals

Acetate of Lime—Production is still said to be on a curtailed basis due to the large stocks on hand. Demand has been better and asking prices are maintained at \$3 per 100 lb.

Acetate of Lead—Throughout the varied fluctuations in price for the metal the former selling schedule has been kept in force for the acetate. Sellers quote brown broken at 13@14c. per lb., white broken at 14@14½c. per lb., white crystals at 14½@15c. per lb., and granular at 14½@14¾c. per lb.

Arsenic—The market has remained in a more or less nominal position and prices are pretty much a matter of negotiation. Japanese arsenic on spot was offered at 6½c. per lb. and European grades at 7c. per lb. Domestic arsenic is nominally quoted at 7½c. per lb.

Barium Chloride—Domestic makers have lowered prices to \$80 per ton but imported chloride has been higher and sales were reported at \$75 per ton, whereas as low as \$72 per ton could have been done in the preceding week. Carbonate of barium was quiet and spot holdings were available at \$56 per ton.

Formaldehyde—Attempts to hold the market at the 9c. per lb. level have not been successful and open prices of 8½c. per lb. have been quoted for carlots. While competition is keen some sellers are not willing to shade 9c. per lb. and prices depend on seller.

Sal Ammoniac—Interest in imported white sal ammoniac was sustained but demand was for smaller amounts. There was no change in conditions and spot material was held at 6@6½c. per lb. with shipments at 5½c. per lb.

Salt Cake—Sellers are said to have good sized amounts on hand and while

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	151.83
Last week	152.66
Sept., 1923	172.00
Sept., 1922	148.00
Sept., 1921	147.00
Sept., 1920	267.00
Sept., 1919	272.00
Sept., 1918	278.00

Continued weakness in crude cottonseed oil offset moderate gains in prices for alcohol and miscellaneous chemicals. The weighted index number declined 83 points.

demand has gained there is still a disposition to press sales. This has kept asking prices down to \$17 per ton in bulk at works but prices range upward according to seller and make.

Coal-Tar Products

Production of Byproduct Coke in August Gains 2.4 Per Cent—Steady Market for Phenol, Pyridine and Aniline Oil

THERE was a moderate gain in production of byproduct coke during August, reflecting better conditions in the market for iron and steel. According to the figures compiled by the Geological Survey the output increased to the extent of 2.4 per cent, contrasted with the July total. August production of byproduct coke amounted to 2,425,000 tons, which compares with 2,367,000 tons in July. The present rate of production is 22 per cent less than the average monthly output for 1923. The market easily absorbed all of the offerings of coal-tar crudes, and, with few exceptions, spot stocks are almost nil. In the case of sulphate of ammonia the market is sold up and prices are little more than nominal. Benzene prices have been on a fairly steady basis, notwithstanding the low selling basis for gasoline. There was a fair call for phenol and sellers' views appear to be firmer. Demand for aniline oil was better. Naphthalene was dull and easy. Pyridine on spot remains in scanty supply and with foreign markets higher the undertone at the close was quite firm. Some improvement was reported in the request for paranitraniline.

Aniline Oil and Salt—Trading took place on the old basis of 16c. per lb., drums extra, carload lots, prompt shipment from works. Stocks are moderate and a firm undertone features the market. Aniline oil for red was nominally unchanged at 40c. per lb. Aniline salt was irregular, prices ranging from 20@23c. per lb., according to seller.

Benzene—No change occurred in the market. Holdings remain light and this tends to steady sellers' ideas. The supply situation should improve from now on, according to traders, as coke-oven operations again are on the increase. Quotations held at 23c. per gal. on the 90 per cent grade, and 25c. per gal. on the pure, tank cars, f.o.b. works.

Benzaldehyde—Competition for business in the technical grades tends to keep prices down. Nominal quotations ranged from 68@72c. per lb. The mar-

Alcohol

An advance of 3c. per gal. in denatured alcohol became effective on Sept. 15. The uplift was brought about by the generally higher level of prices now prevailing on the different raw materials. Business has been good, reflecting improvement in trade in the consuming industries. The revised trading basis for formula No. 5 quotes 49c. per gal., in drums, carload lots. Special denatured, formula No. 1, closed at 50c. per gal., in drums, carload lots.

Methanol prices remained unchanged, but the undertone was firmer in some quarters. The 97 per cent grade held at 76c. per gal., in bbl., carload lots. Pure methanol in tank cars closed steady at 75c. per gal.

Butyl alcohol was in steady demand and producers say that the plants are operating to capacity.

ket for the U.S.P. material held at \$1.50 per lb., with the F.F.C. at \$1.60 per lb., in drums.

Cresylic Acid—Importations have fallen off because of slow trade and increased competition from domestic sources of supply. The market was irregular, prices covering a wide range. On the 97 per cent grade there were sellers at 63@68c. per gal., according to color, etc. Foreign markets were quiet and barely steady.

H Acid—The demand for this intermediate has picked up somewhat, but prices did not change, holding nominally at 72@75c. per lb.

Naphthalene—Business in refined was inactive and, with supplies ample, prices continued to drag. There were sellers of white refined flake at 4½@5c. per lb. Chips held nominally at 4@4½c. per lb., carload basis. English makers reported the market for crude as unchanged, prices holding at \$5@£8 per ton, depending upon the grade, with the undertone steady on rumors of better inquiry from American buyers.

Paranitraniline—Inquiry was in evidence and this steadied prices in some directions. The market settled at 68@72c. per lb., according to quantity and seller.

Phenol—Some holders refused to shade 25c. per lb., in drums, immediate delivery, indicating that the market has worked into a firmer position. On round lots for delivery over the last quarter 24c. could be done. Most producers have little in the way of a surplus to offer. Demand continues to improve.

Pyridine—A small shipment of pyridine arrived from abroad in the past week. The offerings were scanty and with firm advices from the other side the market held at the recent advance to \$4.50@\$4.75 per gal.

Solvent Naphtha—Producers reported a steady situation in solvent naphtha, maintaining the selling basis of 25c. per gal. for the water white, tank cars, f.o.b. works.

Vegetable Oils and Fats

Refined Cottonseed Oil Lower—Linseed Oil Unsettled—Menhaden Oil Production Smaller—Tallow and Greases Decline

LIQUIDATION of October cottonseed oil in the option market sent prices sharply lower. Crude cottonseed oil, however, underwent little change, as offerings were not large enough to result in selling pressure. Several round lots of linseed oil were purchased for future delivery at virtually unchanged prices. China wood oil was strong on uncertainty regarding future shipments from China, due to the political disturbances. Coconut oil steadied on smaller offerings from Manila. Rapeseed oil sold for shipment from England at an advance. Soap makers were buyers of tallow and greases at lower prices.

Cottonseed Oil—Interest centered in the action of the market for prime summer yellow refined oil. On Wednesday heavy selling took place in the option market on the Produce Exchange, transactions in October oil alone amounting to 21,200 bbl. This brought out a sharp decline in prices. Weakness in grains and lard also served to depress values. There was buying on the break by refiners and packers. A moderate recovery took place later, as selling pressure disappeared. The selling of October oil was engineered by operators who had accumulated contracts in anticipation of a shortage in supplies before new oil could be placed on the market in volume. Consuming demand fell away at the recent advance and with crop prospects favorable crude oil became available at more attractive prices, creating a feeling of uncertainty in bull circles. During the past week crude oil sold at 7½@8c. per lb., tank cars, f.o.b. mills. Prime summer yellow oil on Thursday settled at 9.70@10c. per lb., in bbl., September option, 9.75@9.77c. per lb., in bbl., October option and 9.61@9.64c. per lb., in bbl., December option. Lard compound was inactive and the market declined to 12½@13c. per lb., carload basis. Pure lard in Chicago was irregular, closing with the cash position at 13.32c. per lb. Stocks of pure lard in the Chicago district on Sept. 15 amounted to 66,590,000 lb., against 50,749,000 lb. a year ago.

Linseed Oil—Official estimates of acreage sown to flaxseed in the Argentine, according to the Department of Commerce's attache at Buenos Aires, indicate an increase of 8.1 per cent over last season. The area is estimated at 5,681,000 acres, which compares with 5,253,000 acres a year ago and 4,048,000 acres for the 1922-23 season. Because of mixed reports on the condition of the crop the gain in acreage in the Argentine had little influence upon the market. Latest news from South America reported drouth in most sections of the flaxseed belt. The North American seed markets eased off slightly on general weakness in grains. Receipts of new crop seed have increased, but demand from crushers continues urgent. The position of the market for oil underwent little change. Some good inquiries for November forward

oil were around early in the week and crushers showed willingness to take on contracts at former prices. October-November oil sold at 93c. per gal., cooperage basis, while on November alone sales took place at 91c. per gal., same terms. November-April was nominal at 87@88c. per gal., cooperage basis. September delivery oil sold at \$1 per gal.

China Wood Oil—With no change for the better in the Chinese situation holders of oil took a rather firm view of the market. Spot oil was raised to 16c. per lb., in bbl., New York. On the Pacific coast prompt shipment oil in sellers' tank cars closed at 14½@14¾c. per lb., with futures at 13¾@14c. per lb.

Vegetable Oil Imports for 7 Months Decline in Value

Imports of vegetable oils for the 7 months ended July 31 were valued at \$34,818,588, which compares with \$43,969,043 for the same period a year ago. Imports of vegetable oils for the 7 months period, with a comparison, follow:

	1924	1923
China wood, lb....	41,562,738	53,279,558
Coconut, lb....	122,403,466	118,429,037
Olive, edible, lb....	50,793,422	46,942,408
Olive foots, lb....	17,138,479	
Palm, lb....	52,137,344	101,210,420
Palm kernel, lb....	1,162,718	
Peanut, lb....	13,991,760	6,575,042
Rapeseed, gal....	1,453,822	1,206,011
Linseed, lb....	3,790,351	37,091,833
Soya bean, lb....	5,254,167	32,872,290
Other oils, free, lb.	6,579,472	16,029,834
Other oils, dut., lb.	2,070,768	1,855,081

Corn Oil—Last sales of crude corn oil for September delivery went over at 9c. per lb., tank cars, Chicago. The market was unsettled at the close.

Coconut Oil—About a week ago a bulk lot of Manila oil, Ceylon type, sold at 8½c. per lb. c.i.f. New York. Operators now ask 8½c. per lb. On the Pacific coast bulk oil for shipment from Manila settled at 8½c. asked. Ceylon type oil for immediate shipment from the coast in tank cars closed at 8½c. per lb., while on futures 8½c. could have been done on a firm bid.

Olive Oil Foots—Offerings of spot oil were reported at 9½c. per lb. The market was quiet, but fairly steady.

Palm Oils—The decline in tallow discouraged buying of palm oil. Offerings from abroad were moderate and prices showed little change. Lagos on spot was available at 8½c., while this figure was also named on futures. Niger oil for shipment from Africa held at 7.80c. per lb., c.i.f. New York.

Rapeseed Oil—Buying of refined oil for first quarter of 1925 delivery took place at a sharp advance in price. It was reported that 89½c. was paid on futures. Spot oil advanced to 87@88c. per gal.

Sesame Oil—Refined oil for September delivery was lowered to 12½c. per lb., with the market unsettled on weakness in cottonseed oil.

Menhaden Oil—Fishing so far this season has disappointed operators. Trade authorities estimate that not much more than 30,000 bbl. of crude menhaden oil has been produced to date, which compares with total production of 150,000 bbl. a years ago. The season will be over in about 1 month. Stocks are moderate and 50c. per gal., tank cars, works, is asked.

Tallow, Etc.—Soap makers were buyers of extra special tallow at 8½c. per lb., ex melters' plant, a decline of ¼c. for the week. A fair amount of yellow grease sold at prices ranging from 7@7½c. per lb., a decline of ¼c. per lb. Oleo stearine was weak at 11c. asked, which compares with 12½c. asked a week ago. Red oil was 9½c. per lb.

Miscellaneous Materials

Antimony—The market again closed slightly higher, conditions in China remaining uncertain, restricting offerings. Chinese brands closed at 11@11½c. per lb. Cookson's "C" grade was firm at 13@13½c. per lb. Chinese needle, lump, nominal at 8½@9c. per lb. White oxide, Chinese, 99 per cent, 11½@12c. per lb.

Blanc. Fixe—Producers offered supplies in a fairly liberal way at 3½c. per lb. on the dry, in bbl., carload lots, prompt shipment from works. The undertone of the market was steady, some operators asking 4c. per lb.

Glycerine—No further changes occurred in the market for either crude or refined glycerine. Offerings were moderate and holders' views quite firm. Last sales of dynamite went through at 18½c. per lb., in drums, carload lots, f.o.b. point of production Middle West. Chemically pure on spot held at 19@19½c. per lb. Crude soap lye, basis 80 per cent, held at 12½@12¾c. per lb., loose, carload lots, f.o.b. point of production.

Lithopone—Competition among producers is sharp and prices covering round lots for forward delivery vary considerably. Some producers offered prompt goods rather freely at 5½c. per lb., f.o.b. works. Leading makers, however, continued to quote the market at 6c. per lb., in bags, carload basis.

Naval Stores—Moderately lower prices prevailed for spirits of turpentine, reflecting unsettlement at Southern distributing centers. Spirits sold at 88c. per gal., in bbl. Rosins held steady at \$6.10@\$6.20 per bbl. on the lower grades.

White Lead—The official contract price for pig lead was maintained at 8c. per lb. The market for pigments was reported as being in a satisfactory position, new business being up to normal in volume considering the season of the year. Corrodors maintained prices on the basis of 10c. per lb. for standard dry white lead, in bbl. or cask, carload lots.

Zinc Oxide—There was practically no change in the metal market and the pigment has held a steady position. Most large consumers are covered ahead and contract deliveries are absorbing a large part of production. Sellers quote American process, lead free at 7½c. per lb. in bags, carload lots.

Imports at the Port of New York

September 12 to September 18

ACIDS—Cresylic—3 dr., Liverpool, Order. Phenol—3 kegs, Liverpool, Order. Stearic—20 cs., Rotterdam, M. W. Parsons & Plymouth Organic Lab.; 63 bg., Rotterdam, Ponds Extract Co. Tartaric—100 csk., Rotterdam, W. Benkert & Co.; 445 csk., Palermo, Order. Tar—20 dr., Antwerp, Lunham & Reeve.

ALBUMEN—33 csk., Hamburg, International Acceptance Bank; 107 cs., Shanghai, French, Kremer Co.; 49 cs., Shanghai, J. Lowe Co.; 44 cs., Shanghai, Stein, Hall & Co.; 142 cs., Shanghai, Order.

ALCOHOL—200 bbl. and 50 dr., San Juan, C. Esteve.

AMMONIUM NITRATE—153 csk., nitrate, Hamburg, Kuttroff, Pickhardt & Co.

ANTIMONY REGULUS—500 cs., Shanghai, C. Giltan.

ANTIMONY SULPHIDE—200 csk., Bordeaux, Heemsoth, Basse Co.; 14 csk., London, Order.

ARCHIL LIQUOR—5 csk., London, W. Mohrmann.

ARSENIC—184 bbl., Tampico, American Metal Co.; 600 cs., Kobe (at San Francisco), Order; 150 bbl., Hamburg, LoCurto & Funk.

BARIUM CHLORIDE—53 bbl., Hamburg, E. Suter & Co.

BARIUM PEROXIDE—138 bbl., Hamburg, W. A. Brown & Co.

BLANC FIXE—18 csk., Hull, Ansco Photo Products Co.

BRONZE POWDER—10 cs., Bremen, B. F. Drakenfeld; 23 cs., Bremen, T. Riessner.

CAMPHOR—200 cs., Shanghai, Hetherman & Co.; 160 cs., Hamburg, Equitable Trust Co.; 90 csk., Hamburg, Order.

CASEIN—417 kg., Buenos Aires, First National Bank of Boston; 416 kg., Buenos Aires, Irving Bank-Col. Trust Co.; 417 kg., Buenos Aires, Brown Bros. & Co.; 1,668 kg., Buenos Aires, Kalbfleisch Corp.

CHALK—610 kg., ground, Antwerp, L. H. Butcher & Co.; 600 kg., Antwerp, Cooper & Cooper; 800,000 kilos crude, Dunkirk, J. W. Higman Co.; 100 kg., Hull, Whittaker, Clarke & Daniels; 240 kg., London, Brown Bros. & Co.; 275 kg., Bristol, H. J. Baker & Bro.; 500 tons black, London, Baring Bros. & Co.

CHEMICALS—250 bg., Rotterdam, P. Uhlich & Co.; 154 csk., Rotterdam, A. Kastor; 5 pkg., Rotterdam, Grasselli Dye-stuff Corp.; 28 csk., Hamburg, Jungmann & Co.; 10 bbl., Bremen, Hummel & Robinson; 56 csk., Glasgow, Fraser & Co.; 46 pkg., Hamburg, J. C. Robold & Co.; 100 csk., Bordeaux, State Forwarding & Shipping Co.; 72 csk., London, Toch Bros.; 250 bg., London, A. Kilstein & Co.; 130 csk., Rotterdam, Roessler & Hasslacher Chemical Co.; 599 cs., Rotterdam, Order; 1 cs., Hamburg, Elmer & Amend; 1,500 cs., Hamburg, Schering & Glatz; 200 bg., Hamburg, Jungmann & Co.; 45 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

CHROME ORE—1,000 tons, Madras, Order; 1,059,900 kilos, Beira, Irving Bank-Col. Trust Co.

CLAY—300 bg. fire, Antwerp, Lunham & Moore; 200 bg. do., Antwerp, Order; 512 tons china, Bristol, Moore & Munger; 150 tons china, Bristol, Paper Makers Supply Co.; 25 tons do., Bristol, United Clay Mines, Inc.

CORUNDUM ORE—138 bg., Delagoa Bay, Order; 1,166 bg., Durban, Standard Bank of South Africa.

COLORS—36 csk., earth, Bremen, Fenzl & Sperle; 16 csk., ultramarine blue, Glasgow, A. Maharrie; 5 bbl., Hamburg, Fenzl & Sperle; 2 cs., Havre, B. F. Drakenfeld & Co.; 6 csk., aniline, Rotterdam, Kuttroff, Pickhardt & Co.; 1 csk., Hamburg, H. A. Metz & Co.; 3 csk., dry, Hamburg, Kuttroff, Pickhardt & Co.; 4 pkg., Hamburg, Franklin Import & Export Corp.; 8 bbl., aniline, Genoa, Irving Bank-Col. Trust Co.; 11 bbl., do., Genoa, Order; 22 pkg., aniline, Havre, Sandoz Chemical Works; 18 csk., do., Havre, Ciba Co.; 2 bbl., Havre, Carbic Color & Chemical Co.; 17 csk., do., Havre, Geigy Co.; 25 csk., ultramarine blue, Antwerp, J. Campbell & Co.

COPPER OXIDE—50 dr., Hamburg, Order.

FULLERS EARTH—750 bg., London, L. A. Salomon & Bros.; 250 bg., London, L. A. Salomon & Bros.; 250 bg., Bristol, Order.

FUSEL OIL—23 csk., Hamburg, Mechanics & Metals National Bank.

GAMBIER—116 cs., Padang, Heidelberg, Ickelheimer & Co.

GLYCERINE—20 dr. crude, Marseilles, Order; 52 cs., Rotterdam, N. Y. Trust Co.; 59 dr. crude, Rotterdam, Order; 10 dr. crude, Dunkirk, Order; 100 bbl. crude, Marseilles, Marx & Rawolle.

GRAPHITE—300 bg., London, Barber S. S. Line.

GUMS—500 bg. arabic, Sudan, Brown Bros. & Co.; 200 bg. do., Sudan, Lee, Higginson & Co.; 250 bg. do., Sudan, Order; 1,548 bg. copal, Antwerp, Order; 179 bskt. damar, Ambon, Innes & Co.; 428 bskt. copal, Order; 262 bskt. copal, Macassar, France, Campbell & Darling; 198 bskt. do., Macassar, Paterson, Boardman & Knapp; 401 bskt. do., Macassar, Kidder, Peabody Accept. Corp.; 2,192 bskt. and 140 cs. do., Macassar, Innes & Co.; 878 pkg. do., Macassar, Order; 112 cs. damar, Batavia, Innes & Co.; 100 cs. damar, Batavia, Chemical National Bank; 100 cs. damar, Batavia, F. R. Henderson & Co.; 200 pkg. damar, Singapore, Chemical National Bank; 140 bg. and 200 cs. copal, Singapore, L. C. Gillespie & Sons; 92 pkg. kauri, Auckland, Guaranty Trust Co.; 33 cs. do. kauri, Auckland, Brown Bros. & Co.; 180 pkg. do., Auckland, Irving Bank-Col. Trust Co.; 326 pkg. do., Auckland, Chemical National Bank; 350 bg. do., Auckland, Chase National Bank; 899 bg. do., Auckland, Order; 200 bg. copal, Antwerp, Equitable Trust Co.

INDIGO PASTE—234 kegs, Shanghai, E. I. du Pont de Nemours & Co.

IRON OXIDE—18 csk., Liverpool, Reichard-Coulston, Inc.; 2 csk., Liverpool, E. M. & F. Waldo; 61 csk., Liverpool, J. A. McNulty; 5 csk., Liverpool, Hanson & Van Winkle; 90 csk., Liverpool, Order; 30 csk., Hull, J. Lee Smith & Co.; 228 bbl., Malaga, W. Schall & Co.; 100 bbl., Malaga, Scott L. Libby Co.; 160 bbl., Malaga, C. J. Osborn Co.; 20 bbl., Malaga, Hummel & Robinson Corp.; 100 bbl., Malaga, E. M. & F. Waldo; 91 bbl., Malaga, Reichard-Coulston, Inc.; 470 bbl., Malaga, C. K. Williams & Co.; 82 bbl., Malaga, Order; 214 bg., Bristol, Order.

IRON POWDER—23 cs., Bremen, Mal-linckrodt Chemical Works.

LITHOPONE—250 csk., Antwerp, E. M. & F. Waldo.

MAGNESITE—312 bg., Rotterdam, Spelden, Whitfield & Co.; 250 bg. and 101 bbl., Rotterdam, Innis, Spelden & Co.; 12,000 bg., Madras, Order.

MAGNESIUM METAL—4 cs., Hamburg, Valmont Co.

MANGANESE ORE—1,057 bg., Antilla, H. S. Predmore; 404 bg., Santiago, Irving Bank-Col. Trust Co.

MANGROVE BARK—2,000 bg., Singapore, Order.

MYROBALANS—2,295 bg., Vizapapatam, Order; 90 bg., Coconada, Order.

NUX VOMICA—572 bg., Madras, Order.

OCHE—9 csk., Liverpool, B. F. Drakenfeld & Co.; 130 bbl., Marseilles, American Exchange National Bank; 120 csk., Marseilles, J. Lee Smith & Co.; 679 csk., Marseilles, Reichard-Coulston, Inc.

OILS—Cod—200 csk., St. Johns, National Oil Products Co.; 105 csk., Halifax, Cook & Swan, Inc. China Wood—126 bbl., Shanghai, Mitsui & Co.; 300 csk., Shanghai, Paterson, Boardman & Knapp; 680 tons (in bulk), Shanghai, International Banking Corp.; 154 csk., Shanghai, Standard Bank of South Africa; 150 csk., Shanghai, Order. Linseed—425 tons (in bulk), Hull, Order; 475 tons, Hull, Balfour, Williamson & Co. Olive Foots (sulphur oil)—600 bbl., Lisbon, Heidelberg, Ickelheimer & Co. Palm Kernel—363 bbl. and 101 csk., Hull, Order. Palm—360 csk., Lagos, Irving Bank-Col. Trust Co.; 506 csk., Port Harcourt, Irving Bank-Col. Trust Co.; 172 csk., Abonnema, Order; 129 csk., Rotterdam, Order; 24 csk., Liverpool, Fourth Street National Bank; 36 csk., Liverpool, Order; 160 csk., Liverpool, Gar-

field National Bank. Peanut—100 bbl., Tsingtao (At San Francisco), Order. Rape-seed—200 bbl., Rotterdam, National City Bank; 430 bbl., Hull, Balfour-Williamson & Co.; 50 bbl., Hull, J. D. Irwin & Co.; 590 bbl., Hull, Order. Sesame—110 bbl., Rotterdam, Rayner & Stonington; 137 bbl., Bristol, Order. Vegetable—100 dr., Hull, American-Hawaiian S. S. Co.

OIL SEEDS—Castor—6,790 bg., Coconada, Order; 25 bg., Port au Prince, S. L. Brinley. Copra—29 bg., St. Anna Bay, Franklin Baker Co. Linseed—43,443 bg., Rosario, Spencer Kellogg & Sons; 1,600 tons (in bulk), Buenos Aires, Order; 17,897 bg., Buenos Aires, Order. Sesame—600 bg., Shanghai, Bank of America.

POTASSIUM SALTS—166 bg. sulphate, Bremen, Potash Importing Corp. of Am.; 5,000 bg. muriate, Antwerp, Societe Comm. des Potasses d'Alsace; 132 dr. caustic and 100 csk. chlorate, Hamburg, Superfos Co.; 1,500 csk. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 100 dr. permanganate, Hamburg, Order; 81 bbl. alum, Hamburg, Order; 15 bbl. prussiate, Hamburg, Order; 3 kegs nitrate, Hamburg, Order.

PLUMBAGO—37 bbl., Colombo, Brown Bros. & Co.; 96 bbl., Colombo, N. Y. Trust Co.; 99 bbl., Colombo, Order.

PYRIDINE—2 dr., Antwerp, A. Hurst & Co.

QUEBRACHO—1,989 bg. extract, Buenos Aires, Commonwealth Atlantic National Bank; 2,720 bg., Buenos Aires, Guaranty Trust Co.; 2,040 bg., Buenos Aires, Order; 15,463 bg., Buenos Aires, Winthrop, Beekman Co.

QUICKSILVER—21 flasks, Vera Cruz, J. Schroeder; 40 flasks, Vera Cruz, Poillon & Poirier.

ROSIN SOLUTION—30 csk., Hamburg, Franklin Import & Export Corp.

ROSIN—10 bbl., Azua, Mecke & Co.

SAL AMMONIAC—42 csk., Hamburg, Seaboard National Bank; 56 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

SHELLAC—294 cs. sticklac, Singapore, Order; 80 bg., Hamburg, Irving Bank-Col. Trust Co.; 30 kg., Hamburg, Kasebier-Chatfield Shellac Co.

SODIUM SALTS—15 csk. prussiate, Rotterdam, Order; 290 cs. cyanide, Havre, American-Hawaiian S. S. Co.; 19 csk. prussiate, Liverpool, Bank of the United States; 60 cs. cyanide, Liverpool, American-British Chemical Supplies, Inc.; 168 cs. cyanide, Liverpool, Order; 100 dr. sulphite, Bristol, R. F. Downing & Co.; 20 kegs do., Bristol, J. W. Hampton & Co.; 350 kegs hyposulphite, Antwerp, De Mattia Chemical Co.; 234 dr. sulphite, Hamburg, C. S. Grant & Co.; 45 csk. prussiate, Liverpool, C. Tennant Sons & Co.; 175 cs. cyanide, Hamburg, Roessler & Hasslacher Chemical Co.

TALC—200 bg., Genoa, C. B. Chrystal & Co.

TANNIC EXTRACT—82 bbl., Palamos, Tannin Corp.

TARTAR—513 bg., Barcelona, Harshaw, Fuller & Goodwin; 608 bg., Marseilles, Royal Baking Powder Co.; 100 bg., Marseilles, C. Pfizer & Co.; 142 bg., Valencia, C. Pfizer & Co.; 210 bg., Marseilles, Harshaw, Fuller & Goodwin; 136 bg., Alicante, C. Pfizer & Co.

THORIUM NITRATE—20 cs., Bremen, Pfaltz & Bauer.

WATTLE BARK—1,848 bg. chopped, Durban, Smith, Kirkpatrick & Co.

WAXES—4 bg. beeswax, Sanchez, E. A. Canalizo & Co.; 12 bg. do., Monopla, D. Steengrafe; 100 cs. vegetable, Kobe, National City Bank; 26 cs. beeswax, Sr. Nazaire, Order; 1,400 bg. paraffine, Balikpapan, Asiatic Petroleum Co.; 20 pkg. beeswax, Hamburg, Order; 1,993 bg. paraffine, London, Order; 44 bg. beeswax, Rio de Janeiro, National City Bank; 174 bg. do., Rio de Janeiro, American Trading Co.; 56 bg. carnauba, Rio de Janeiro, Order; 23 bg. beeswax, Azua, Order.

WHITING—4,770 bg. powdered, Dunkirk, Taintor Trading Co.

WOOL GREASE—52 cs., Hamburg, Lehn & Fink; 13 bbl., Manchester, Swan & Finch; 90 bbl., Antwerp, Order.

WHITE LEAD—100 kegs, London, J. Lee Smith & Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetone, drums, wks.	lb.	\$0.16	\$0.16
Acetic anhydride, 85% dr.	lb.	.34	.36
Acetic, 56%, bbl.	100 lb.	3.12	3.37
Acetic, 80%, bbl.	100 lb.	8.85	6.10
Glacial, 99%, bbl.	100 lb.	8.19	8.44
Boric, bbl.	100 lb.	11.01	11.51
Citric, kegs.	lb.	.09	.09
Formic, 85%, bbl.	100 lb.	.45	.47
Gallie, tech.	lb.	.12	.13
Hydrofluoric, 52%, carboys	lb.	.45	.47
Lactic, 44%, tech., light	lb.	.11	.12
22% tech., light, bbl.	100 lb.	.12	.13
Muriatic, 18% tanks.	100 lb.	.06	.06
Muriatic, 20% tanks.	100 lb.	.80	.85
Nitric, 36%, carboys.	100 lb.	.95	1.00
Nitric, 42%, carboys.	100 lb.	.04	.04
Oleum, 20%, tanks.	100 lb.	.04	.05
Oxalic, crystals, bbl.	100 lb.	16.00	17.00
Phosphoric, 50%, carboys.	100 lb.	.09	.09
Pyrogallie, resublimed.	lb.	.07	.08
Sulphuric, 60%, tanks.	100 lb.	1.55	1.60
Sulphuric, 66%, tanks.	100 lb.	8.00	9.00
Sulphuric, 66%, drums.	100 lb.	12.00	13.00
Sulphuric, 66%, tanks.	100 lb.	13.00	14.00
Sulphuric, 66%, drums.	100 lb.	17.00	18.00
Tannic, U.S.P., bbl.	100 lb.	.65	.70
Tannic, tech., bbl.	100 lb.	.45	.50
Tartaric, imp., powd., bbl.	100 lb.	.26	.28
Tartaric, domestic, bbl.	100 lb.	.29	.30
Tungstic, per lb.	100 lb.	1.20	1.25
Alcohol, butyl, drums, f.o.b.	100 lb.	.27	.30
Alcohol ethyl (Cologne spirit), bbl.	100 lb.	4.86	4.84
Ethyl, 190 p.f. U.S.P., bbl.	100 lb.	4.84	4.84
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	100 lb.	.56	.....
No. 1, 190 proof, special, dr.	100 lb.	.50	.....
No. 1, 188 proof, bbl.	100 lb.	.59	.....
No. 1, 188 proof, dr.	100 lb.	.53	.....
No. 5, 188 proof, bbl.	100 lb.	.55	.....
No. 5, 188 proof, dr.	100 lb.	.49	.....
Alum, ammonia, lump, bbl.	100 lb.	.03	.04
Potash, lump, bbl.	100 lb.	.02	.03
Chromic, lump, potash, bbl.	100 lb.	.05	.06
Aluminum sulphate, com.			
bags.	100 lb.	1.35	1.40
Iron free bags.	100 lb.	2.35	2.45
Aqua ammonia, 26%, drums.	100 lb.	.06	.06
Ammonia, anhydrous, cyl.	100 lb.	.28	.30
Ammonium carbonate, powd.			
tech., casks.	100 lb.	.12	.12
Ammonium nitrate, tech.			
casks.	100 lb.	.09	.10
Amyl acetate tech., drums.	100 lb.	2.75	3.00
Antimony oxide, white, bbl.	100 lb.	.11	.12
Arsenic, white, powd., bbl.	100 lb.	.07	.07
Arsenic, red, powd., kegs.	100 lb.	.14	.15
Barium carbonate, bbl.	100 lb.	56.00	57.00
Barium chloride, bbl.	100 lb.	75.00	83.00
Barium dioxide, 88%, drums.	100 lb.	.17	.18
Barium nitrate, casks.	100 lb.	.07	.08
Blanc fixe, dry, bbl.	100 lb.	.03	.04
Bleaching powder, f.o.b. wks.			
drums.	100 lb.	1.90	2.25
Spot N. Y. drums.	100 lb.	2.20	2.25
Borax, bbl.	100 lb.	.05	.05
Bromine, cases.	100 lb.	.34	.38
Calcium acetate, bags.	100 lb.	3.00	3.05
Calcium arsenate, dr.	100 lb.	.08	.09
Calcium carbide, drums.	100 lb.	.05	.05
Calcium chloride, fused, dr. wks.	100 lb.	21.00	.....
Gran. drums works.	100 lb.	27.00	.....
Calcium phosphate, mono.			
bbl.	100 lb.	.06	.07
Camphor, Jap. cases.	100 lb.	.68	.69
Carbon bisulphide, drums.	100 lb.	.06	.06
Carbon tetrachloride, drums.	100 lb.	.06	.07
Chalk, precip.—domestic.			
light, bbl.	100 lb.	.04	.04
Domestic, heavy, bbl.	100 lb.	.03	.04
Imported, light, bbl.	100 lb.	.04	.05
Chlorine, liquid, tanks, wks.	100 lb.	.04	.....
Contract, tanks, wks.	100 lb.	.04	.....
Cylinders, 100 lb. wks.	100 lb.	.05	.07
Chloroform, tech., drums.	100 lb.	.30	.32
Cobalt, oxide, bbl.	100 lb.	2.10	2.25
Copperas, bulk, f.o.b. wks.	100 lb.	16.00	17.00
Copper carbonate, bbl.	100 lb.	.17	.17
Copper cyanide, drums.	100 lb.	.45	.46
Copper oxide, kegs.	100 lb.	.16	.17
Coppersulphate, dom., bbl.	100 lb.	4.50	4.75
Imp. bbl.	100 lb.	4.30	4.40
Cream of tartar, bbl.	100 lb.	.20	.21
Epsom salt, dom., tech.	100 lb.	1.75	2.00
bbl.	100 lb.	1.75	2.00
Epsom salt, imp., tech.	100 lb.	1.35	1.37
bbl.	100 lb.	1.35	1.37
Epsom salt, U.S.P., dom.	100 lb.	2.10	2.35
bbl.	100 lb.	2.10	2.35
Ether, U.S.P., dr. concent'd.	100 lb.	.13	.14
Ethyl acetate, 85%, drums.	100 lb.	.92	.95

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal.	\$1.08	\$1.10
Formaldehyde, 40%, bbl.	100 lb.	.08	.09
Fullers earth—f.o.b. mines.	ton	7.50	18.00
Furfural, works, bbl.	100 lb.	.25	.....
Fusel oil, ref., drums.	100 lb.	3.50	3.75
Fusel oil, crude, drums.	100 lb.	2.50	3.00
Glaucous salt, wks., bags.	100 lb.	1.20	1.40
Glaucous salt, imp., bags.	100 lb.	.90	.92
Glycerine, c. p., drums extra.	100 lb.	.19	.19
Glycerine, dynamite, drums.	100 lb.	.18	.18
Glycerine, crude 80%, loose.	100 lb.	.12	.12
Hexamethylene, drums.	100 lb.	.65	.70
Lead:			
White basic carbonate, dry.	100 lb.	.10	.....
White, basic sulphate, casks.	100 lb.	.09	.....
White, in oil, kegs.	100 lb.	.11	.11
Red, dry, casks.	100 lb.	.11	.....
Red, in oil, kegs.	100 lb.	.13	.13
Lead acetate, white crys., bbl.	100 lb.	.14	.....
Brown, broken, casks.	100 lb.	.13	.....
Lead arsenate, powd., bbl.	100 lb.	.16	.18
Lime-Hydrated, b.g., wks.	100 lb.	10.50	12.50
Bbl. wks.	100 lb.	18.00	19.00
Lime, lump, bbl.	280 lb.	3.63	3.65
Litharge, comm., casks.	100 lb.	.10	.....
Lithopone, bags.	100 lb.	.06	.06
Magnesium carb., tech., bags.	100 lb.	.08	.08
Methanol, 95%, bbl.	100 lb.	.74	.76
Methanol, 97%, bbl.	100 lb.	.76	.78
Methanol, pure, tanks.	100 lb.	.75	.....
drums.	100 lb.	.78	.80
bbl.	100 lb.	.83	.85
Methyl-acetone, t'ks.	100 lb.	.70	.....
Nickel salt, double, bbl.	100 lb.	.09	.10
Nickel salts, single, bbl.	100 lb.	.10	.11
Orange mineral, csk.	100 lb.	.14	.14
Phosgene.	100 lb.	.60	.75
Phosphorus, red, cases.	100 lb.	.70	.75
Phosphorus, yellow, cases.	100 lb.	.37	.40
Potassium bichromate, casks.	100 lb.	.08	.08
Potassium bromide, gran.	100 lb.	.25	.38
Potassium carbonate, 80-85%.	100 lb.	.05	.05
calcined, casks.	100 lb.	.06	.08
Potassium chlorate, powd.	100 lb.	.47	.52
Potassium cyanide, drums.	100 lb.	.08	.08
Potassium, first sorta, cask.	100 lb.	.08	.08
Potassium hydroxide (Caustic potash) drums.	100 lb.	.06	.....
Potassium iodide, cases.	100 lb.	3.65	3.75
Potassium nitrate, bbl.	100 lb.	.06	.07
Potassium permanganate, drums.	100 lb.	.13	.13
Potassium prussiate, red.	100 lb.	.37	.38
casks.	100 lb.	.17	.17
Potassium prussiate, yellow.	100 lb.	.17	.17
casks.	100 lb.	.06	.06
Salammoniac, white, gran.	100 lb.	.07	.08
casks, imported.	100 lb.	.08	.09
Salammoniac, white, gran.	100 lb.	.07	.08
bbl., domestic.	100 lb.	.08	.09
Gray, gran., casks.	100 lb.	.08	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk) works.	100 lb.	17.00	18.00
Soda ash, light, 58% flat.	100 lb.	1.25	.....
bag, contract.	100 lb.	1.38	.....
Soda ash, dense, bulk, contract.	100 lb.	1.35	.....
bag, contract.	100 lb.	1.45	.....
Soda, caustic, 76%, solid.	100 lb.	3.10	.....
drums contract.	100 lb.	3.50	3.85
Soda, caustic, ground and flake, contracts, dr.	100 lb.	2.85	3.05
Soda, caustic, solid, 76% f.a.s. N. Y.	100 lb.	.04	.05
Sodium acetate, works, bbl.	100 lb.	1.75	.....
Sodium bicarbonate, bulk.	100 lb.	2.00	.....
330 lb. bbl.	100 lb.	.06	.07
Sodium bichromate, casks.	100 lb.	6.00	7.00
Sodium bisulphate (niter cake) ton	100 lb.	.04	.04
Sodium bisulphite, powd.	100 lb.	.06	.07
U.S.P., bbl.	100 lb.	.04	.04
Sodium chlorate, kegs.	100 lb.	.06	.07
Sodium chloride, long ton	100 lb.	12.00	13.00
Sodium cyanide, cases.	100 lb.	.19	.22

Sodium fluoride, bbl.	100 lb.	\$0.08	\$0.09
Sodium hyposulphite, bbl.	100 lb.	.02	.02
Sodium nitrate, casks.	100 lb.	.09	.09
Sodium peroxide, powd., cases	100 lb.	.23	.27
Sodium phosphate, dibasic, bbl.	100 lb.	.03	.03
Sodium prussiate, yel. bbl.	100 lb.	.09	.09
Sodium silicic, drums.	100 lb.	.38	.40
Sodium silicate (40%, drums)	100 lb.	.75	1.15
Sodium silicate (60%, drums)	100 lb.	1.75	2.00
Sodium sulphide, fused, 60-62% drums.	100 lb.	.02	.03
Sodium sulphite, crys., bbl.	100 lb.	.02	.02
Strontium nitrate, powd., bbl.	100 lb.	.09	.10
Sulphur chloride, yel drums.	100 lb.	.04	.05
Sulphur, crude.	100 lb.	18.00	20.00
At mine, bulk.	100 lb.	16.00	18.00
Sulphur, flour, bag.	100 lb.	2.25	2.35
Sulphur, roll, bag.	100 lb.	2.00	2.10
Sulphur dioxide, liquid, cyl.	100 lb.	.08	.08
Tin bichloride, bbl.	100 lb.	.14	.....
Tin oxide, bbl.	100 lb.	.35	.....
Tin crystals, bbl.	100 lb.	.12	.14
Zinc carbonate, bags.	100 lb.	.06	.07
Zinc chloride, gran, bbl.	100 lb.	.36	.37
Zinc cyanide, drums.	100 lb.	.08	.08
Zinc dust, bbl.	100 lb.	.07	.....
Zinc oxide, lead free, bag.	100 lb.	.06	.....
5% lead sulphate bags.	100 lb.	.06	.....
10 to 35% lead sulphate, bags.	100 lb.	.06	.....
French, red seal, bags.	100 lb.	.09	.....
French, green seal, bags.	100 lb.	.10	.....
French, white seal, bbl.	100 lb.	.11	.....
Zinc sulphate, bbl.	100 lb.	3.00	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	100 lb.	\$0.62	\$0.65
Alpha-naphthol, ref., bbl.	100 lb.	.65	.75
Alpha-naphthylamine, bbl.	100 lb.	.35	.36
Aniline oil, drums.	100 lb.	.16	.16
Aniline salt, bbl.	100 lb.	.20	.22
Anthracene, 80%, drums.	100 lb.	.70	.75
Anthraquinone, 25%, paste, drums.	100 lb.	.75	.80
Benzaldehyde U.S.P., carboys	100 lb.	1.50	.....
f.f.c. drums.	100 lb.	1.60	.....
tech, drums.	100 lb.	.68	.72
Benzene, pure, water-white, tanks, works.	100 lb.	.25	.....
Benzene, 90%, tanks, works.	100 lb.	.23	.....
Benzidine base, bbl.	100 lb.	.80	.82
Benzidine sulphate, bbl.	100 lb.	.70	.72
Benzoic acid, U.S.P. kegs.	100 lb.	.75	.85
Benzoate of soda, U.S.P., bbl.	100 lb.	.62	.65
Benzyl chloride, 95-97%, ref. carboys.	100 lb.	.35	.....
Benzyl chloride, tech., drums.	100 lb.	.25	.....
Beta-naphthol, tech., bbl.	100 lb.	.24	.25
Beta-naphthylamine, tech.	100 lb.	.65	.70
Cresol, U.S.P., drums.	100 lb.	.23	.26
Ortho-cresol, drums.	100 lb.	.28	.32
Cresylic acid, 97%, works drums.	100 lb.	.63	.65
95-97%, drums, works.	100 lb.	.58	.60
Dichlorobenzene, drums.	100 lb.	.07	.08
Diethylaniline, drums.	100 lb.	.59	.62
Dimethylaniline, drums.	100 lb.	.35	.36
Dinitrobenzene, bbl.	100 lb.	.15	.17
Dinitrochlorobenzene, bbl.	100 lb.	.21	.22
Dinitronaphthalene, bbl.	100 lb.	.30	.32
Dinitrophenol, bbl.	100 lb.	.35	.40
Dinitrotoluene, bbl.	100 lb.	.18	.20
Dip oil, 25%, drums.	100 lb.	.26	.28
Diphenylamine, bbl.	100 lb.	.48	.50
H-acid, bbl.	100 lb.	.72	.75
Meta-phenylenediamine, bbl.	100 lb.	.95	1.00
Michlers ketone, bbl.	100 lb.	3.00	3.25
Monochlorobenzene, drums.	100 lb.	.08	.10
Monoethylaniline, drums.	100 lb.	1.20	1.30
Naphthalene, flake, bbl.	100 lb.	.04	.05
Naphthalene, balls, bbl.	100 lb.	.05	.05
Naphthionate of soda, bbl.	100 lb.	.60	.65
Naphthionic acid, crude, bbl.	100 lb.	.60	.62
Nitrobenzene, drums.	100 lb.	.09	.09
Nitro-naphthalene, bbl.	100 lb.	.25	.27
Nitro-toluene, drums.	100 lb.	.13	.14
N-W acid, bbl.	100 lb.	1.00	1.05
Ortho-aminophenol, kegs.	100 lb.	2.40	2.50
Ortho-dichlorobenzene, drums.	100 lb.	.12	.13
Ortho-nitrophenol, bbl.	100 lb.	.95	1.00
Ortho-nitrobenzene, drums.	100 lb.	.11	.12
Ortho-toluidine, bbl.	100 lb.	.14	.16
Para-aminophenol, base, kegs.	100 lb.	1.20	1.25
Para-aminophenol, HCl, kegs.	100 lb.	1.30	1.40
Para-dichlorobenzene, bbl.	100 lb.	.17	.20
Para-nitraniline, bbl.	100 lb.	.68	.70
Para-nitrotoluene, bbl.	100 lb.	.50	.55
Para-phenylenediamine, bbl.	100 lb.	1.35	1.45
Para-toluidine, bbl.	100 lb.	.75	.80
Phthalic anhydride, bbl.	100 lb.	.25	.30
Phenol, U.S.P., dr.	100 lb.	.24	.26
Picric acid, bbl.	100 lb.	.20	.22
Pitch, tanks, works.	100 lb.	27.00	30.00
Pyridine, imp., drums.	100 lb.	4.50	4.75
Resorcinol, tech., kegs.	100 lb.	1.30	1.40

Resorcinol, pure, kegs.	lb.	\$2.00	\$2.25
R-salt, bbl.	lb.	.50	.55
Salicylic acid, tech. bbl.	lb.	.32	.33
Salicylic acid, U.S.P. bbl.	lb.	.35	
Solvent naphtha, water-white, tanks.	gal.	.25	
Crude, tanks.	gal.	.22	
Sulphanilic acid, crude, bbl.	lb.	.16	.18
Tolidine, bbl.	lb.	1.00	1.05
Tolidine, mixed, kegs.	lb.	.30	.35
Toluene, tank cars, works.	gal.	.26	
Toluene, drums, works.	gal.	.31	
Xylidine, drums.	lb.	.40	.42
Xylene, 5 deg.-tanks.	gal.	.38	.40
Xylene, com., tanks.	gal.	.25	.27

Naval Stores

Rosin B-D, bbl.	280 lb.	\$6.05	\$6.15
Rosin E-F, bbl.	280 lb.	6.25	6.35
Rosin K-N, bbl.	280 lb.	6.35	6.45
Rosin W.G.-W.W., bbl.	280 lb.	7.60	8.00
Wood rosin, bbl.	280 lb.	5.40	5.50
Turpentine, spirits of, bbl.	gal.	.88	
Wood, steam dist., bbl.	gal.	.75	
Wood, dest. dist., bbl.	gal.	.56	
Pine tar pitch, bbl.	200 lb.	5.50	
Tar, kiln burned, bbl.	500 lb.	10.50	
Retort tar, bbl.	500 lb.	10.50	
Rosin oil, first run, bbl.	gal.	.40	
Rosin oil, second run, bbl.	gal.	.42	
Rosin oil, third run, bbl.	gal.	.46	
Pine oil, steam dist.	gal.	.60	
Pine tar oil, com'l.	gal.	.30	

Animal Oils and Fats

Deerfat, bbl.	lb.	\$0.03	\$0.05
Grease, yellow, loose.	lb.	.07	.07
Lard oil, Extra No. 1, bbl.	gal.	.84	.85
Lard compound, bbl.	lb.	.12	.13
Neatsfoot oil, 20 deg. bbl.	gal.	1.30	
No. 1, bbl.	gal.	.84	.86
Oleo Stearine.	lb.	.11	
Oleo oil, No. 1, bbl.	lb.	.17	
Red oil, distilled, d.p. bbl.	lb.	.09	.09
Rapeseed oil, bbl.	lb.	.09	.09
Tallow, extra, loose works.	lb.	.08	
Tallow oil, acidless, bbl.	gal.	.84	.86

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	\$0.16	\$0.06
Castor oil, No. 1, bbl.	lb.	.16	.17
China wood oil, bbl.	lb.	.16	
Cocoon oil, Ceylon, bbl.	lb.	.10	.10
Ceylon, tanks, N. Y.	lb.	.09	.09
Cocoon oil, Cochon, bbl.	lb.	.10	.10
Corn oil, crude, bbl.	lb.	.10	.11
Crude, tanks, (f.o.b. mill).	lb.	.09	.09
Cottonseed oil, crude (f.o.b. mill), tanks.	lb.	.08	.08
Summer yellow, bbl.	lb.	.10	.10
Winter yellow, bbl.	lb.	.13	.13
Linseed oil, raw, car lots, bbl.	gal.	1.00	1.02
Raw, tank cars (dom.)	gal.	.94	
Boiled, cars, bbl. (dom.)	gal.	1.02	1.04
Olive oil, denatured, bbl.	gal.	1.18	1.22
Sulphur, (f.o.b.) bbl.	lb.	.09	.09
Palm, Lagos, casks.	lb.	.08	.08
Niger, casks.	lb.	.07	.08
Palm kernel, bbl.	lb.	.09	
Peanut oil, crude, tanks (mill)	lb.	.12	
Peanut oil, refined, bbl.	lb.	.16	.16
Perilla, bbl.	lb.	.14	.14
Rapeseed oil, refined, bbl.	gal.	.87	.88
Sesame, bbl.	lb.	.13	.13
Soya bean (Manchurian), bbl.	lb.	.12	.12
Tank, f.o.b. Pacific Coast.	lb.	.10	.10
Tank, (f.o.b. N. Y.)	lb.	.11	.11

Fish Oils

Cod, Newfoundland, bbl.	gal.	\$0.63	\$0.65
Menhaden, light pressed, bbl.	gal.	.64	
White bleached, bbl.	gal.	.66	
Blown, bbl.	gal.	.68	
Crude, tanks (f.o.b. factory)	gal.	.50	
Whale No. 1 crude, tanks, coast.	lb.		
Winter, natural, bbl.	gal.	.75	.76
Winter, bleached, bbl.	gal.	.78	.79

Oil Cake and Meal

Coconut cake, bags.	ton	\$33.00	\$34.00
Cottonseed meal, f.o.b. mills.	ton	36.00	38.00
Linseed cake, bags.	ton	47.50	48.00
Linseed meal, bags, spot.	ton	49.00	49.50

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	\$0.50	\$0.55
Albumen, egg, tech, kegs.	lb.	.95	.97
Cochineal, bags.	lb.	.33	.35
Cutb, Borneo, bales.	lb.	.04	.04
Cutb, Rangoon, bales.	lb.	.13	.14
Dextrine, corn, bags.	100 lb.	4.32	4.75
Dextrine, gum, bags.	100 lb.	4.82	5.09
Divi-divi, bags.	ton	41.00	42.00
Fustic, sticks.	ton	30.00	35.00
Fustic, chips, bags.	lb.	.04	.05
Gambier com., bags.	lb.	.15	.15
Logwood, sticks.	ton	25.00	26.00
Logwood, chips, bags.	ton	.02	.03
Sumac, leaves, Sicily, bags.	ton	165.00	170.00
Sumac, ground, bags.	ton	160.00	165.00
Sumac, domestic, bags.	ton	50.00	55.00
Starch, corn, bags.	100 lb.	3.87	4.08
Tapica flour, bags.	lb.	.04	.06

Extracts

Archil, cone., bbl.	lb.	\$0.16	\$0.19
Chestnut, 25% tannin, tanks.	lb.	.01	.02
Divi-divi, 25% tannin, bbl.	lb.	.05	.05
Fustic, crystals, bbl.	lb.	.20	.22
Fustic, liquid, 42% bbl.	lb.	.08	.09
Gambier, liq., 25% tannin, bbl.	lb.	.11	.11
Hematin, crys., bbl.	lb.	.14	.18
Hemlock, 25% tannin, bbl.	lb.	.03	.04
Hyperic, solid, drums.	lb.	.22	.24
Hyperic, liquid, 51% bbl.	lb.	.12	.13
Logwood, crys., bbl.	lb.	.14	.15
Logwood, liq., 31% bbl.	lb.	.07	.08
Osage Orange, 51% liq., bbl.	lb.	.07	.08
Osage Orange, powder, bag.	lb.	.14	.15
Quebracho, solid, 65% tannin, bbl.	lb.	.04	.04
Sumac, dom., 51% bbl.	lb.	.06	.06

Dry Colors

Blacks—Carbonas, bags, f.o.b. works, contract.	lb.	\$0.09	\$0.11
spot, cases.	lb.	.12	.16
Lampblack, bbl.	lb.	.12	.40
Mineral, bulk.	ton	35.00	45.00
Blues—Bronze, bbl.	lb.	.36	.38
Prussian, bbl.	lb.	.36	.38
Ultramarine, bbl.	lb.	.07	.35
Browns, Sienna, Ital., bbl.	lb.	.05	.12
Sienna, Domestic, bbl.	lb.	.03	.03
Umber, Turkey, bbl.	lb.	.04	.04
Greens—Chrome, C.P. Light, bbl.	lb.	.28	.30
Chrome, commercial, bbl.	lb.	.10	.11
Paris, bulk.	lb.	.24	.26
Reds, Carmine No. 40, tins.	lb.	4.25	4.50
Iron oxide red, casks.	lb.	.08	.12
Para toner, kegs.	lb.	.95	1.00
Vermilion, English, bbl.	lb.	1.30	1.35
Yellow, Chrome, C.P. bbls.	lb.	.17	.17
Ocher, French, casks.	lb.	.02	.03

Waxes

Bayberry, bbl.	lb.	\$0.21	\$0.21
Beeswax, crude, Afr. bag.	lb.	.26	.26
Beeswax, refined, light, bags.	lb.	.34	.34
Beeswax, pure white, casks.	lb.	.40	.41
Candelilla, bags.	lb.	.25	.26
Carnauba, No. 1, bags.	lb.	.34	.36
No. 2, North Country, bags	lb.	.25	.26
No. 3, North Country, bags	lb.	.22	.23
Japan, casks.	lb.	.16	.17
Montan, crude, bags.	lb.	.06	.06
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06	.06
Crude, scale 124-126 m.p. bags.	lb.	.05	.05
Ref., 118-120 m.p. bags.	lb.	.05	.06
Ref., 123-125 m.p. bags.	lb.	.06	.06
Ref., 128-130 m.p. bags.	lb.	.06	.06
Ref., 133-135 m.p. bags.	lb.	.07	.08
Ref., 135-137 m.p. bags.	lb.	.10	.10
Stearic acid, agle. pressed, bags	lb.	.11	.11
Double pressed, bags.	lb.	.11	.12
Triple pressed, bags.	lb.	.12	.13

Fertilizers

Acid phosphate, 16%, bulk, works.	ton	\$7.50	\$7.75
Ammonium sulphate, bulk f.o.b. works.	100 lb.	2.65	
Blood, dried, bulk.	unit	4.10	4.15
Bone, raw, 3 and 50, ground.	ton	26.00	28.00
Fish crap, dom., dried, wks.	unit	4.75	
Nitrate of soda, bags.	100 lb.	2.45	
Tankage, high grade, f.o.b. Chicago.	unit	2.60	3.00
Phosphate rock, f.o.b. mines	ton	3.25	3.70
Florida pebble, 68-72%.	ton	6.75	7.00
Tennessee, 75%.	ton	34.55	
Potassium muriate, 80%, bags	ton	45.85	
Potassium sulphate, bags basis 90%.	ton	26.35	
Double manure salt, bags.	ton	10.25	
Kainit, 14%, bags.	ton		

Crude Rubber

Para—Upriver fine.	lb.	\$0.27	
Upriver coarse.	lb.	.18	
Upriver caucho ball.	lb.	.17	
Plantation—First latex crepe	lb.	.28	
Ribbed smoked sheets	lb.	.27	
Amber crepe No. 1.	lb.	.27	.28

Gums

Copal, Congo, amber, bags.	lb.	\$0.08	\$0.10
East Indian, bold, bags.	lb.	.13	.14
Manila, amber, bags.	lb.	.14	.16
Pontinik, No. 1, bags.	lb.	.19	.20
Damar, Batavia, casks.	lb.	.24	.25
Singapore, No. 1, casks.	lb.	.27	.28
Singapore, No. 2, casks.	lb.	.18	.18
Kauri, No. 1, casks.	lb.	.58	.64
Ordinary chips, casks.	lb.	.21	.22
Manjak, Barbados, bags.	lb.	.06	.09

Shellac

Shellac, orange fine, bags.	lb.	\$0.64	\$0.65
Orange superfine, bags.	lb.	.66	.67
A. C. garnet, bags.	lb.	.58	.60
Bleached, bonedry.	lb.	.72	.71
Bleached, fresh.	lb.	.61	.62
T. N., bags.	lb.	.61	.62

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec.	sh. ton	\$300.00	\$350.00
Asbestos, shingle, f.o.b., Quebec.	sh. ton	50.00	60.00
Asbestos, cement, f.o.b., Quebec.	sh. ton	15.00	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00	17.00
Barytes, grd., off-color, f.o.b., Balt.	net ton	13.00	14.00
Barytes, floated, f.o.b., St. Louis, bbl.	net ton	23.00	24.00
Barytes, crude f.o.b. mines, bulk.	net ton	8.00	9.00
Casein, bbl., tech.	lb.	.10	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	7.00	8.00
Washed, f.o.b. Ga.	net ton	8.50	9.00
Powd., f.o.b. Ga.	net ton	14.00	20.00
Crude, f.o.b. Va.	net ton	6.00	8.00
Ground, f.o.b. Va.	net ton	15.00	20.00
Imp., lump, bulk.	net ton	45.00	50.00
Imp., powd., bulk.	net ton	4.50	7.25
Feldspar, No. 1, f.o.b. N.C. long ton	long ton	4.50	5.00
No. 2 f.o.b. N.C.	long ton	15.32	21.00
No. 1 gr'd. N.C.	long ton		
No. 1 Canadian, f.o.b., mill, powd.	long ton	20.00	
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05	.06
Ceylon, chip, bbl.	lb.	.04	.05
High grade amorphous crude.	ton	15.00	35.00
Gum arabic, amber, sorts, bags.	lb.	.12	.12
Gum tragacanth, sorts, bags.	lb.	.50	.55
No. 1, bags.	lb.	1.20	
Kieselguhr, f.o.b. Cal.	ton	40.00	42.00
F.o.b. N.Y.	ton	50.00	55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00	45.00
Pumice stone, imp., casks.	lb.	.03	.40
Dom. lump, bbl.	lb.	.06	.08
Dom. ground, bbl.	lb.	.03	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00	2.25
Silica, sand blast, f.o.b. Ind.	ton	2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00	
Silica, glass sand, f.o.b. Ill.	ton	2.00	2.50
Soapstone, coarse, f.o.b., Vt., bags.	ton	7.50	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra.	ton	10.50	
Talc, 200 mesh, f.o.b., Ga., bags.	ton	9.50	10.00
Talc, 325 mesh, f.o.b. New York, grade A bags.	ton	14.75	

Minerals Oils

Crude, at Wells

Pennsylvania.	bbl.	\$2.75	\$3.00
Corning.	bbl.	1.75	
Cabell.	bbl.	1.45	
Somerset.	bbl.	1.55	
Illinois.	bbl.	1.62	
Indiana.	bbl.	1.63	
Kansas and Okla. under 28 deg.	bbl.	.85	
California, 35 deg. and up.	bbl.	1.40	

Gasoline, Etc.

Motor gasoline steel bbls.	gal.	\$0.18	
Naphtha, V. M. & P. deod, steel bbls.	gal.	.17	
Kerosene, ref. tank wagon.	gal.	.13	
Bulk, W.W. delivered, N.Y.	gal.	.07	.07
Lubricating oils:			
Cylinder, Penn., filtered.	gal.	.29	.32
Bloomless, 30/31 grav.	gal.	.20	.21
Paraffin, pale 885 vis.	gal.	.15	.16
Sprinkle, 200, pale.	gal.	.21	.21
Petrolatum, amber, bbls.	lb.	.04	.04
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al ₂ O ₃ , f.o.b. Pittsburgh.	1,000	\$140	\$145
Chrome brick, f.o.b. Eastern shipping points.	ton	45	47
Chrome cement, 40-50% Cr ₂ O ₃ .	ton	23	27
40-45% Cr ₂ O ₃ , sacks, f.o.b. Eastern shipping points.	ton	23	00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40	43
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	33	37
Magnesite brick, 9-in. straight (f.o.b. wks).	ton	65	68
9-in. arches, wedges and keys.	ton	80	85
Seraps and splits.	ton		85
Silica brick, 9-in. sizes, f.o.b. Chicago district.	1,000	48	50
Silica brick, 9-in. sizes, f.o.b. Birmingham district.	1,000	48	50
F.o.b. Mt. Union, Pa.	1,000	35	38
Silicon carbide refract brick, 9-in.	1,000	1,160	00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	\$200.00	
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Ferrochromium, per lb. of		
Cr, 1-2% C.....	lb.	\$0.30 -
4-6% C.....	lb.	.121-
Ferromanganese, 78-82% Mn, Atlantic seaboard, duty paid.....	gr. ton	92.50 - \$95.00
Spiegeleisen, 19-21% Mn.....	gr. ton	33.00 - 35.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.....	lb.	2.00 - 2.25
Ferrosilicon, 10-12% Si, 50%.....	gr. ton	39.50 - 43.50
Ferrotungsten, 70-80% W, per lb. of W.....	lb.	.88 - .90
Ferro-uranium, 35-50% U, per lb. of U.....	lb.	4.50 -
Ferrovandium, 30-40% V, per lb. of V.....	lb.	3.25 - 3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points.....	ton	\$5.50 - \$8.75
Chrome ore, Calif. concentrates, 50% min. Cr ₂ O ₃	ton	22.00 -
C.i.f. Atlantic seaboard.....	ton	19.00 - 24.00
Coke, fdry., f.o.b. ovens.....	ton	4.00 - 4.50
Coke, furnace, f.o.b. ovens.....	ton	3.10 - 3.25
Fluorspar, gravel, f.o.b. mines, Illinois.....	ton	17.50 - 18.50
Ilmenite, 52% TiO ₂ Va.....	lb.	.011-
Manganese ore, 50% Mn, c.i.f. Atlantic seaboard.....	unit	.42 - .46
Manganese ore, chemical (MnO ₂).....	ton	75.00 - 80.00
Molybdenite 85% MoS ₂ , per lb. Mo S ₂ , N. Y.....	lb.	.70 -
Monazite, per unit of ThO ₂ , c.i.f. Atl. seaport.....	lb.	.06 - .08
Pyrites, Span., fines, c.i.f. Atl. seaport.....	unit	.111 - .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport.....	unit	.12 -
Pyrites, dom. fines, f.o.b. mines, Ga.....	unit	.12 -
Rutile, 94@96% TiO ₂	lb.	.12 - .15
Tungsten, scheelite, 60% WO ₃ and over.....	unit	9.00 -
Tungsten, wolframite, white, 60% WO ₃	unit	8.25 - 8.50
Uranium ore (carnotite) per lb. of U ₃ O ₈	lb.	3.50 - 3.75
Uranium oxide, 96% per lb. U ₃ O ₈	lb.	12.25 - 12.50
Vanadium pent oxide, 99%.....	lb.	12.50 - 14.00
Vanadium ore, per lb. V ₂ O ₅	lb.	1.00 - 1.25
Zircon, 99%.....	lb.	.06 - .07

Non-Ferrous Metals

Copper, electrolytic.....	lb.	\$0.131 - \$0.131
Aluminum, 98 to 99%.....	lb.	.27 - .28
Antimony, wholesale, Chinese and Japanese.....	lb.	.11 - .111
Nickel, 99%.....	lb.	.271 - .29
Monel metal, shot and blocks.....	lb.	.32
Tin, 5-ton lots, Straits.....	lb.	.48
Lead, New York, spot.....	lb.	.08
Lead, E. St. Louis, spot.....	lb.	.0785
Zinc, spot, New York.....	lb.	.06525
Zinc, spot, E. St. Louis.....	lb.	.06175
Silver (commercial).....	oz.	.691
Cadmium.....	lb.	.60
Bismuth (508 lb. lots).....	lb.	1.85 - 1.90
Cobalt.....	lb.	2.50 - 3.00
Magnesium, ingots, 99%.....	lb.	.90 - .95
Platinum, refined.....	oz.	118.00
Iridium.....	oz.	260.00 - 270.00
Palladium, refined.....	oz.	75.00 - 83.00
Mercury.....	75 lb.	71.00 - 72.00
Tungsten powder.....	lb.	.95 - 1.00

Finished Metal Products

	Warehouse Price	Cents per Lb.
Copper sheets, hot rolled.....		20.621
Copper bottoms.....		29.75
Copper rods.....		20.00
High brass rods.....		17.25
High brass rods.....		14.75
Low brass wire.....		19.50
Low brass rods.....		20.00
Braided bronze tubing.....		24.75
Seamless copper tubing.....		22.75
Seamless high brass tubing.....		21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound:

Copper, heavy and crucible.....	10.50 @	11.75
Copper, heavy and wire.....	11.00 @	11.25
Copper, light and bottoms.....	9.50 @	
Lead, heavy.....	6.75 @	6.80
Lead, ton.....	5.00 @	5.25
Brass, heavy.....	6.50 @	
Brass, light.....	5.50 @	
No. 1 yellow brass turnings.....	7.00 @	7.25
Zinc scrap.....	3.75 @	4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by 1/2 in. and larger, and plates 1 in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes.....	\$3.34	\$3.34
Soft steel bars.....	3.24	3.24
Soft steel bar shapes.....	3.54	3.54
Soft steel bands.....	3.99	3.99
Plates, 1/2 to 1 in. thick.....	3.34	3.34

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

GADSDEN—The Gadsden Clay Products Co. has preliminary plans under way for the rebuilding of the portion of its local plant recently destroyed by fire with loss reported at \$20,000.

CALERA—O'Neal's Lime Works, Inc., is said to have tentative plans in preparation for the construction of a new plant for the manufacture of lime products for building service. John H. Adams is president.

California

SAN FRANCISCO—The Bass-Hueter Paint Co., 2240 24th St., is having plans drawn for the construction of a new plant on 3-acre tract of land bounded by De Haro, Army, Kansas and Mariposa Sts., comprising several 1-story buildings estimated to cost approximately \$450,000, with equipment. It is expected to ask bids on general contract at an early date. The company engineering department, address noted, is in charge.

AUBURN—The Associated Oil Co., San Francisco, has selected a local site for the construction of a new oil storage and distributing plant, estimated to cost about \$100,000, including equipment. Permission for the installation has been secured from the city.

Connecticut

NEW BRITAIN—The Vulcan Iron Works, Inc., manufacturer of malleable iron castings, an interest of the Eastern Malleable Iron Co., Naugatuck, Conn., has awarded a general contract to the Lawrence & Coe Construction Co., Hartford, Conn., for the erection of its proposed new plant at Whiting and John Sts., consisting of a main 3-story building, 80x275 ft., and L-extension, 80x100 ft., with 1-story structure adjoining to be equipped as an annealing works. Foundations will soon be laid. Max J. Unkelbach, New Britain, is architect.

Delaware

WILMINGTON—The Hearn Oil Co. will remodel and improve the former works of the Bethlehem Steel Co., at Commerce and 3rd Sts., recently acquired, for a new works. A number of new buildings will be erected and complete storage and distributing facilities will be installed, with capacity of 3,500,000 gal. fuel oil, 250,000 gal. lubricating oils and 250,000 gal. gasoline. A laboratory for testing service will be established. A fund of about \$75,000 has been arranged for the work. C. F. Hearn is president, and C. B. Hearn secretary and treasurer.

Georgia

MACON—The General Reduction Co., Dry Branch, Ga., is said to be perfecting plans for the construction of a new clay-bleaching plant at its local properties, consisting of two 1-story units, 65x165 ft. and 38x145 ft., respectively. K. R. Slocum is general manager.

Illinois

UTICA—The Utica Hydraulic Cement Co. has preliminary plans under advisement for the rebuilding of the portion of the machine department at its local mill, destroyed by fire, Sept. 6, with loss estimated at close to \$90,000, including equipment.

RIVERDALE—The Diamond Red Paint Co., 2750 North Lincoln St., Chicago, Ill., is reported to have tentative plans under advisement for the erection of a new plant at Stewart Ave. and 142nd St., Riverdale, to cost in excess of \$45,000. It is expected to select an architect in the near future.

ROCKFORD—The Smith Oil & Refining Co. has acquired an additional tract of 2 acres of land as a site for additions in its fuel oil storage and distributing plant, including stills and other equipment.

Indiana

INDIANAPOLIS—Fire, Sept. 5, destroyed a portion of the plant of the Marietta Mfg. Co., Sherman Drive and 16th St., manufacturer of flat glass products, table tops, etc., with loss estimated at \$22,000. It is planned to rebuild. Arthur Buttler is president.

Kentucky

LOUISVILLE—The Louisville Petroleum & Refining Co., Inter-Southern Life Bldg., has plans under way for the construction of a new oil-refining plant on site selected on the Ohio River, with initial capacity of about 1,000 bbl. per day, estimated to cost close to \$500,000, including machinery. W. W. Mitchell is president.

Maryland

BALTIMORE—The Maryland Cork Co., recently organized, has leased a 2-story building in the Towson section for the establishment of an initial plant for the manufacture of cork gaskets and other cork mechanical specialties. The structure will be remodeled and improved, and equipment installed at an early date. The company is projecting plans for the erection of an entirely new plant in the near future, estimated to cost approximately \$200,000, with machinery. C. Benjamin will be in charge of plant operations.

BALTIMORE—The Seaboard Feldspar Corp., recently chartered under state laws, will take over the plant and business of the Product Operating Co., Equitable Bldg., Baltimore. The plant is located in the Claremont section, and will be improved and extended by the new owner, including the installation of additional grinding and other machinery for commercial feldspar production.

SALISBURY—The Holt Oil Co., Federalburg, Md., has acquired a tract of property on West Main St., and plans to use the site for a new oil storage and distributing plant. Work will be commenced at an early date, and a list of equipment arranged for installation.

Massachusetts

HOLYOKE—The Valley Paper Co. has taken out a permit to erect a 2-story addition to its mill on Water St., estimated to cost about \$27,000, for which a general contract has been awarded to P. J. Kennedy & Co., Holyoke.

PITTSFIELD—The Pittsfield Lime & Stone Co. is perfecting plans for the construction of an addition to its plant at Richmond Summit, to include the installation of four new kilns, hydrating plant, stone crusher and other equipment, with the erection of several buildings, estimated to cost in excess of \$225,000. It is purposed to develop the plant to a maximum of about 1,000 bbl. of lime per day.

Michigan

WYANDOTTE—Fire, Sept. 11, destroyed the enameling plant and other departments of the plant of the Regent Stove Works, Inc., with loss reported at close to \$400,000, including equipment. Preliminary plans are being considered for rebuilding.

BATTLE CREEK—The Waddell Rex Mineral Soap Co., recently organized, will operate a local plant for the manufacture of special soap products. Arrangements are being perfected.

SAULT STE. MARIE—The Cadillac Soo Lumber & Chemical Co. has tentative plans for the rebuilding of the portion of its chemical works destroyed by fire, Sept. 3, with loss reported at approximately \$150,000, including equipment. The reconstruction will cost close to a like amount.

Nebraska

BEATRICE—The Standard Oil Co. has preliminary plans under advisement for the construction of a new oil storage and distributing plant on local site, estimated to cost \$100,000, with equipment.

New Jersey

BELLEVILLE—The Philip J. Murray Co., Inc., recently organized with a capital of \$400,000, has acquired the local plant of the Rogers Wire Works, Mill St., and will take immediate possession. The plant consists of three main structures and five smaller buildings, with total floor area of 52,000 sq. ft., to be used entirely by the new owner for the production of patent leathers. A number of extensions and improvements will be made, and machinery installed at an early date. Philip J. Murray, head of the new organization, was president of the Seton Leather Co., Newark, for a number of years.

CLIFTON—The Ballwood Co., 30 Church St., New York, manufacturer of pipe specialties, etc., has plans for the erection of a 1-story foundry addition, 45x175 ft., on Central Ave., estimated to cost \$25,000. W. G. Pattison, 625 Main Ave., Clifton, is architect.

NEWARK—The Union Smelting & Refining Co., St. Charles St. and Ave. L, has filed plans for the immediate erection of two additions to its plant, one to be used as an ingot building, estimated to cost \$80,000 and \$40,000, respectively. The structures will be equipped for considerable increase in present output.

New York

NEW YORK—The Conley Foll Co., 521 West 25th St., manufacturer of tin foil, etc., has had plans drawn for the construction of a new plant in the vicinity of Long Island City, for which it is expected to break ground at an early date. The cost is reported in excess of \$50,000.

SYRACUSE—Fire, Sept. 9, destroyed a considerable portion of the plant of the Chemical Toilet Corp., Liverpool Rd., manufacturer of chemical specialties, with loss estimated at \$75,000, including equipment. Plans are under consideration for rebuilding.

ROCHESTER—The R. T. French Co., Mustard St., manufacturer of extracts, etc., has awarded a general contract to Alexander, Shumway & Utz, 80 South Fitzhugh St., for the erection of a new 4-story addition to its plant, for which foundations will be laid at once. S. Firestone, 59 South Ave., is architect.

LOCKPORT—The Upson Co., manufacturer of composition wallboard products, has commenced the construction of additional buildings at its plant, to be equipped for considerable increase in output.

Ohio

MOGADORE—The India Tire & Rubber Co., Akron, O., has authorized the erection of a 3-story addition, 60x160 ft., to provide for an increase in output from 900 to 1,500 tires per day. Bids will be asked on a general contract at once. J. M. Alderfer is president.

AKRON—The Mohawk Rubber Co., manufacturer of automobile tires, is planning for the installation of additional machinery at its plant for considerable increase in capacity.

Oklahoma

SAND SPRINGS—The Pierce Petroleum Co. has work under way on enlargements in its local refining plant and purposes to develop the works to a capacity of 10,000 bbl. per day. Extensions will also be made in the different byproducts departments for corresponding increase in output.

QUAPAW—The Quapaw Mining Corp. is perfecting plans for the construction of an additional milling plant at its zinc ore properties in the Davenport district, where a tract of more than 100 acres of land will be developed.

Pennsylvania

PHILADELPHIA—The Philadelphia Grease Mfg. Co., 846 South Swanson St., has awarded a general contract to Frank I. Wints, 1618 North 27th St., for the erection of a new building at 13-17 Norfolk St., estimated to cost \$16,000, for which foundations will be laid at once.

FRANKLIN—The Atlantic Refining Co. is planning for the rebuilding of the portion of its local Eclipse oil-refining plant, destroyed by fire, Sept. 8, with loss reported at close to \$150,000, including equipment.

PHILADELPHIA—The Olney Foundry Co., 180 West Duncannon St., manufacturer of iron and other metal castings, has filed plans for the erection of an addition to its foundry at Duncannon and Mascher Sts., estimated to cost \$25,000.

South Carolina

SPARTANBURG—The Smith-Wilkinson Guano Co., Inc., 143 St. John St., is arranging for the immediate erection of a new 1-story plant for the manufacture of commercial fertilizers. The initial building will approximate 20,000 sq. ft. of floor area, and will cost approximately \$35,000. A general building contract has been let to Joseph M. McCrary, Spartanburg. J. C. Wilkinson is secretary.

ARKWRIGHT—The International Agricultural Corp. is reported to be planning for the rebuilding of the portion of its local fertilizer plant, destroyed by fire, Sept. 2, with loss estimated at \$100,000, including equipment.

Texas

SAN ANGELO—The Big Lake Oil Co., an interest of the Benedum Trees Oil Co., Benedum Trees Bldg., Pittsburgh, Pa., is perfecting plans for the construction of a gasoline-refining plant in the vicinity of Big Lake, Reagan County, oilfields, estimated to cost about \$250,000, including equipment. The company also plans for the construction of a pipe line from Texon to Ranger, in this same district. Levi Smith, formerly connected with the Transcontinental Oil Co., another affiliation of the same parent organization, is president of the Big Lake company; Frank T. Pickrell is vice-president.

FORT WORTH—The Gulf Refining Co., Frick Annex, Pittsburgh, Pa., will begin the erection immediately of an addition to its oil-refining plant at North Fort Worth, to include the installation of stills and considerable other equipment, estimated to cost close to \$700,000.

Virginia

NORFOLK—The Robertson Chemical Co. has plans for the erection of an addition to its local fertilizer plant, estimated to cost about \$30,000.

New Companies

WEST COAST PULP & PAPER CO., INC., Olympia, Wash.; pulp and paper products; \$1,250,000. Incorporators: H. S. Gile, John H. McNary and William H. Trindle, all of Olympia.

ATLAS DRY FERTILIZER CO., Cincinnati, O.; commercial fertilizers; 500 shares of stock, no par value. Incorporators: Forrest W. Smith, Charles Sawyer and W. M. Shohl, all of Cincinnati.

SYNTHOL CHEMICAL CORP., Richmond, Va.; chemicals and chemical byproducts; \$50,000. Incorporators: J. H. Fentress and J. H. Rides, Jr., both of Richmond.

B. FRANK & SONS, INC., Newark, N. J.; to operate a leather tannery; \$125,000. Incorporators: F. P. Finck and Philip Frank, 440 Frelinghuysen Ave., Newark. The last noted is representative.

TOKALON CHEMICAL CORP., New York, N. Y.; chemicals and chemical byproducts; 1,000 shares of stock, no par value. Incorporators: J. F. Kean, C. E. Bates and G. W. Vause. Representatives: Vause & Vause, 42 Broadway, New York.

AMERICAN OIL PRODUCTS CO., 907 Jefferson Bldg., Chicago, Ill.; refined oils; \$130,000. Incorporators: Joseph A. Weil, Joseph Foster and D. W. Voorhees, Jr.

HAMPDEN PAINT & CHEMICAL CO., Springfield, Mass.; paints, oils, chemicals, etc.; \$150,000. Rhea K. Baker, Springfield, is president and treasurer; Donald M. Baker is vice-president.

H. G. WARING & CO., INC., Pinehurst, N. C.; chemical specialties; \$100,000. Incorporators: H. G. Waring and H. G. Phillips, both of Pinehurst.

PERFECTION RUBBER CO., INC., care of the Corporation Service Co., Equitable Bldg., Wilmington, Del., representative; \$1,250,000; mechanical and other rubber products.

GARDEN CITY MINERAL PRODUCTS CO., 4511 Wilcox St., Chicago, Ill.; mortar colors, mineral specialties, etc.; \$20,000. Incorporators: J. J. and T. J. Lyons, and C. M. Lyons.

SPARROW CHEMICAL CO., Brooklyn, N. Y.; chemical specialties; \$25,000. Incorporators: H. W. Tenser and R. Maykowski. Representative: S. R. Gerstein, 299 Broadway, New York.

SMITH COUNTY COTTON OIL & FERTILIZER CO., Tyler, Tex.; cottonseed oil products,

fertilizers, etc.; \$40,000. Incorporators: G. F. Taylor, C. L. Johnson and C. W. Boone, all of Tyler.

ACME LABORATORIES, 45 6th Ave., Newark, N. J.; organized; soaps, etc. Joseph DePowell heads the company.

WISCASSET FELDSPAR CORP., Boston, Mass.; operate feldspar properties and grinding mills for commercial production; \$125,000. Wesley I. Newhall is president, and Arthur E. Lemont, Newton Center, Mass., treasurer and representative.

DANIELS CHEMICAL PROOF INK CO., 4625 Live Oak St., Dallas, Tex.; special inks; capital not stated. J. P. Daniels is president, and P. J. Demerath, vice-president.

BUDD ALLOY & CHEMICAL CORP., New York, N. Y.; chemical specialties, steel alloys, etc.; \$25,000. Incorporators: J. H. Broderick and T. E. R. Beardsley. Representative: Theodore Hansen, 55 Broadway, New York.

STANDARD CHEMICAL CO., Troy, Ala.; chemicals and chemical byproducts; \$100,000. Incorporators: Fred W. and Fox Henderson, and Frank L. Jones, all of Troy.

GENERAL OIL CO., 437 First National Bank Bldg., Denver, Colo.; petroleum products; \$500,000. Incorporators: C. J. Johnson, W. F. Jones and J. H. Foley.

JACK SCOTT PAINT CO., Toledo, O.; paints, varnishes, etc.; \$10,000. Incorporators: C. W. F. Hirkley and H. J. Laach, both of Toledo.

THE KALBFLEISCH CORP., 317 East Main St., Kalamazoo, Mich.; oil and mineral products, bauxite ores, etc.; \$50,000. Incorporators: Laurence R. Verdon and Walter E. Buckingham.

DAVIS TURPENTINE CO., Panama City, Fla.; turpentine and affiliated products; \$60,000. M. E. Davis is president, and Fred T. Bennett, secretary, both of Panama City.

HIGHLAND OIL CO., INC., Denver, Colo.; petroleum products; \$500,000. Incorporators: E. W. Zinser, H. L. Chase and A. E. Lehr. Representative: G. A. Chase, 325 U. S. National Bank Bldg., Denver.

ARMOCORK CORP., New York, N. Y.; cork products; \$20,000. Incorporators: F. D. Chaikan and M. Olesker. Representatives: Chaikan & Olesker, 276 5th Ave., New York.

CYCLONE OIL CO., Kokomo, Ind.; refined oil products; \$50,000. Incorporators: O. H. Buck, William G. Wall and George W. Knowles, all of Kokomo.

WASHINGTON COUNTY MARL-FERTILIZER CO., Hagerstown, Md.; fertilizer products; \$100,000. Incorporators: Charles E. Teale, Herbert D. Stimpson and Juan M. Brown, all of Hagerstown.

FURLONG VARNISH CO., St. Louis, Mo.; varnishes, paints, etc.; \$30,000. Incorporators: F. E. and J. F. Furlong, 5586 Etzel Ave., St. Louis.

BRIDGEPORT REFINING CO., Bridgeport, Tex.; refined petroleum products; \$50,000. Incorporators: W. H. John, H. Hardy and B. B. Poore, all of Bridgeport.

SOAPSTONE PRODUCTS CORP., Philadelphia, Pa., care of the Corporation Guarantee & Trust Co., Land Title Bldg., Philadelphia, representative; soapstone products for commercial use; \$1,500,000.

GEORGIA COTTON OIL CO., Macon, Ga.; cottonseed oil products; \$150,000. Incorporators: John T. Stevens and Fred E. Culvern, both of Macon.

ROCHMAN & JOYCE LEATHER CO., INC., Brockton, Mass.; operate a leather tannery; \$18,000. John J. Joyce is president, and Samuel Rochman, 118 Warren Ave., Brockton, treasurer and representative.

Industrial Notes

Oscar S. Tyson and L. W. Seeligberg have incorporated as O. S. Tyson & Co., Inc., for market analysis, advertising and sales promotion, with an office at 50 Church St., New York. Oscar S. Tyson is president, L. W. Seeligberg vice-president and treasurer, and E. L. Noble secretary.

DE DIETRICH & CIE., France, one of the oldest companies in the world manufacturing enameled apparatus, are entering the American market with their line of cast-iron and steel enameled apparatus for the chemical, food products and allied fields, having appointed the Chemical & Vacuum Machinery Co., Inc., Buffalo, N. Y., as their sole American sales representative.